

**The Role of Some Non-wood Forest Products in Sustainable
Livelihood of Local Communities, Case of Um Rawaba
Locality, Sudan**

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DEDICATION

To the soul of my mother

And to my dear father

To my family brothers and sisters

To my colleagues and friends

To beloved country

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Grateful thanks go to Allah, who gives me health and mentality to complete this work.

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ABSTRACT

The Role of Some Non-wood Forest Products in Sustainable Livelihood of Local Communities, Case of Um Rawaba Locality, Sudan

This study investigates the contribution of some Non-wood Forest Products (NWFPs) to the sustainable livelihood of local communities in Um Rawaba Locality. The study attempts to identify the uses and importance of some NWFPs and to highlight constraints and measures of risks confronting investment in some NWFPs. Two types of data were used to collect the necessary information, namely, primary and secondary data. The primary data collected through interviewing with local people; and group discussion with Forests National Corporation (FNC) staff in the study area.

The main findings of the research are; the majority of the respondents (70%) rely on agriculture as the main source of income besides collection of NWFPs. Handicraft activity based on NWFPs represents the second important activity for income generation. Some respondents (4.7%) rely solely on NWFPs for income generation. The main NWFPs collected from the study area includes Aradaib (fruits of *Tamarindus indica*), Garad (fruit of *Acacia nilotica*), Lalob (fruits of *Balanites aegyptiaca*), Goungolaiz fruits of (*Adansonia digitata*) and Sinamaka (pod of *senna senna*). There are some other NWFPs with limited uses. In the study area NWFPs are collected either for household consumption or for marketing (income generation). For household consumption, NWFPs are collected from distances varying between 1– 2.5 km, while for trading collectors may cross devastating areas for the sake of collecting considerable amount of NWFPs. Hand picking, tree climbing, sticks and stretched mats are used in the process of NWFPs collection. In the study area NWFPs do not contribute significantly to the budget of the (FNC). There are different channels through which the local people dispose their collected NWFPs. NWFPs are liable to damage by birds and insects, therefore their prices are determined by these

factors. The FNC has not exerted any effort to inventor the resource or to assess the natural regeneration of the NWFPs producing trees.

The main conclusions drawn from this study are; It seems that all the family members are indulging with NWFPS directly or indirectly, but still women remain the main collector of the NWFPS as asserted by 73.1% of the respondents indicating that NWFPS is a women profession in the study area. The collection of NWFPS last for five months (September to January) in the study area. The time calendar of collection of NWFPS differs from one product to another. The period between Octobers - December, showed high collection of Tabaldi, Heglig and Sidir fruits. Local people in the study area have limited channels for the disposal of their collected NWFPS. The study recommended some recommendations; The FNC should attempt to give special consideration for the NWFPs producing trees in terms of their regeneration, protection and inventory Extension services provided by the FNC should guarantee the sustainability of the resource for the coming generations.

المستخلص

دور بعض منتجات الغابات غير الخشبية في استدامة المعيشة للمجتمعات المحلية دراسة حالة أم روابة – ولاية شمال كردفان

أجريت هذه الدراسة بمحلية أم روابة لمعرفة مساهمة بعض منتجات الغابات غير الخشبية في استدامة سبل كسب العيش. تعتبر الدراسة محاولة للتعرف علي استخدامات بعض منتجات الغابات غير الخشبية وتسهيل الضوء علي الصعوبات والمخاطر التي تواجه الاستثمار في بعض منتجات الغابات غير الخشبية.

تم استخدام طريقتان لجمع المعلومات الأولية والثانوية. تم جمع المعلومات الأولية عن طريق المسح الاستطلاعي مع السكان المحليين ومجموعات النقاش مع المسؤولين بالهيئة القومية للغابات في منطقة الدراسة. أظهرت النتائج الرئيسية للدراسة: ان غالبية المبحوثين (70%) يعتمدون علي الزراعة كمصدر أساسي للدخل بجانب جمع منتجات الغابات غير الخشبية. تمثل أنشطة الصناعات اليدوية المعتمدة علي منتجات الغابات غير الخشبية النشاط الثاني الهام لجلب الدخل. يعتمد بعض المستهدفين (4.7%) بصورة كاملة علي منتجات الغابات غير الخشبية في جلب الدخل. ثمار العرديب، ثمار القرص، ثمار اللالوب، ثمار القونقليز والسمنكة. هناك بعض منتجات الغابات غير الخشبية لها استخدام محدود في منطقة الدراسة وتجمع للاستهلاك المنزلي أو للتسويق (جلب الدخل). تجمع منتجات الغابات غير الخشبية للاستهلاك المنزلي من مسافات تتراوح من 1 إلي 2.5 كيلومتر وللتجارة يقطع الجامعون مسافات اطول للوصول الى المناطق التي بها هذه المنتجات لجمع كميات معتبرة من المنتجات الغابات غير الخشبية.

يستخدم الجمع اليدوي وتسلق الأشجار والعصي والحصير في عمليات جمع منتجات الغابات غير الخشبية. لا تسهم منتجات الغابات غير الخشبية بطريقة مباشرة في ميزانية الهيئة القومية للغابات في منطقة الدراسة فهناك قنوات أخرى يتعامل معها السكان المحليين في منتجات الغابات غير الخشبية. تتسبب الحشرات والطيور في إلحاق بعض الضرر بمنتجات الغابات غير الخشبية وعليه تعمل هذه العوامل علي تحديد أسعارها. لم تعط الهيئة القومية للغابات القدر الكافي من الاهتمام بالاستكشاف والتقييم للتوالد الطبيعي للأشجار المنتجة لمنتجات الغابات غير الخشبية

اهم مستخلصات هذه الدراسة الأتي:- يشارك كل أعضاء الأسرة في جمع منتجات الغابات غير الخشبية بطريقة مباشرة أو غير مباشرة، ولكن مازالت المرأة تمثل الجامع الرئيسي لهذه المنتجات كما أكدها حوالي 73% من المبحوثين مشيرين إلي أن جمع منتجات الغابات غير الخشبية يعتبر من مهنة النساء في منطقة الدراسة. يستمر جمع منتجات الغابات غير الخشبية في منطقة الدراسة لفترة خمسة اشهر (سبتمبر الي يناير) ويختلف زمن جمع منتجات الغابات غير الخشبية حسب نوع المنتج. أشارت النتائج ان الفترة من اكتوبر الي ديسمبر كان الجمع فيها عال لثمار التبليدي والهجليج والسدر. وتعتبر القنوات محدودة للسكان المحليين في عرض منتجاتهم غير الخشبية بمنطقة الدراسة. أوصت الدراسة بضرورة تضمين خدمات الارشاد التي توفرها الهيئة القومية للغابات في مجال التجدد الطبيعي مع توفر الحماية والرصد. كما أوصت الدراسة بضرورة اعطاء اعتبارات خاصة للأشجار المنتجة للثمار بواسطة الهيئة القومية للغابات

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CHAPTER ONE

INTRODUCTION

1.1 Background

Forest produces a great variety of goods and services for people. Thus forest has value to people and contributes to meet human needs in a number of ways. The contribution occurs through either direct or indirect use of the forest. Forests were recognized as rich reservoirs of many valuable biological resources, not just timber. Non- Wood Forest Products (NWFPs) emerged as an umbrella term to recognize the products derived from these various forest resources as group. The scope of NWFPs was proposed to be defined as all goods of biological origin other than wood as well as services derived from forests and allied land use. NWFPs are an integral part of the livelihood of 500 millions who live in or near tropical forest that cover 20 % of the world land mass (Cfan 1992).

Examining household use of NWFPs it were found that these products were effective in both providing gathered foods that contribute to food self sufficiently and hence food security and saleable products that could supplement income needed to purchase food (Arnold,1995). In supplementing household agricultural production, they are particularly important in reducing shortages suffered during "hunger period" of agricultural cycle. They help to even out seasonal fluctuation in availability of food and often contribute to essential inputs for household nutrition. They are also valued as compartments of social and cultural identity although these uses and values vary enormously from one area to another. Environment dimensions of (NWFPs) cover a wide range of roles and aspects. In fragile ecosystems (NWFPs) activities hold to prospects for integrated forms of development that yield higher rural incomes and conserve biodiversity while not competing with agriculture.

For most of the recorded history, people have valued forests not for wood, but for other products. Ancient writings from China, Egypt and India recorded a wide variety of uses of forest plants, and compilations of botanical knowledge from western Asia were prized by the ancient Greeks (Wickens, 1990). Studies show that forests produce many more types of products than wood products particularly in some tropical forests (Toledo *et. al.*, 1992). Whereas wood products have become major international commodities in modern times, NWFPs rank among the oldest traded commodities (Iqbal, 1993). Ancient Egyptians imported gum arabic from Sudan for use in paints and the mummification process. International trade in sandalwood oil dates back to the twelfth century a. d. Modern science and governments for so long overlooked the importance of this non-wood forest wealth and this might be due to three reasons as was reported by FAO (1995);

- First, most of these products are used mainly for rural subsistence or local markets. They often go unrecorded in official statistics, which focus on nationally traded goods (Chandrasekhar an, 1994).
- Second, because modern government administration has divided these products among forestry, agriculture and horticulture, statistics do not recognize even nationally and internationally important non-wood forest commodities as originating from the forest. The divisions between, and the lack of clear definition of, agriculture and forestry have created a large blind spot in the way we reckon our dependence on forests.
- Finally, modern forestry has favored timber and large scale enterprises, and has generally regarded NWFPs as incidental.

Through the experience of forest communities, forestry professionals have recently rediscovered the great importance of NWFPs (including food, fruits and fibers, dye stuffs, flavors and medicines) for meeting people's needs (FAO,1995). As that forests, trees and woodlands, and the wild plants and animals they contained, were once the main source of food for many early

hunter-gatherer societies. Over the millennia, it is the development of cultivated varieties of wheat, rice and the other staple crops, and the domestication of livestock, man's dependence on forests has declined. Nevertheless, there are a great many rural people who remain dependent on forests for critical portions of their food supplies (FAO, 1989). Where isolated forest communities exist in which wild plants and animals are still the major source of food. In India, for example some tribal groups depend almost entirely on hunting and gathering in forests and have little contact with the outside world. Similar communities exist in Papua New Guinea and in parts of Africa and Latin America. But while they are the most obvious examples, these are not the only people who rely on forest foods; for many millions of families living outside the forests, forest foods remain an essential supplement to their diet (FAO, 1989).

Several attempts have been made in recent years to catalogue forest food species (FAO, 1982; 1986). Although a large number of species have been identified with food uses, often very little is known about the quantities produced, the seasonality of production, or its variability from year to year. Thus, it is often difficult to assess their relative importance as food sources. Broadly, forest plant foods can be categorized as leaves, seeds and nuts, fruits, tubers and roots, fungi, gum and sap. Collectively they add diversity and flavoring as well as providing protein, energy, vitamins and essential minerals to the human diet. Some are collected and consumed raw while others require complex processing before they can be eaten (FAO, 1989). Often forest foods are added to soups and sauces which accompany staple foods. they are often smoked, dried or fermented, and one of the common uses of these products is as snacks. Forests, trees and woodlands also provide a habitat for many animals, birds, insects and other forms of wildlife that are hunted and consumed, often as delicacies. While these forest foods rarely provide staples, they do provide important supplements as well as seasonal and emergency substitutes when food supplies dwindle. Adding to that in mangrove areas,

the forests are a habitat and breeding ground for many fish, crustacean and other marine animals that support coastal and off-shore fisheries. Although the quantities of forest foods involved may be small, their nutritional contribution is often critical, especially at certain times of the year, and during droughts or other emergency periods when cultivated foods are unavailable (FAO, 1989). Some forest foods, are consumed throughout the year by rural households, but the most wide spread use of forest foods is in meeting seasonal food shortages either as nutrition gaps or hunger periods these usually occur at the end of the dry season, they are also valued during peak periods of agricultural work, when less time is available for cooking. Forests and woodland areas, especially in Africa, have traditionally played a vital role during emergency periods, such as in drought, famine and war times (FAO, 1989; 1991).

The array of different foods consumed is vast; it ranges from beetle larvae to nuts and honey. For example, in the arid and semi- arid Saharan belt of Africa, as many as 800 different edible plant species have been identified (Becker, 1986). One group of agro-pastoralists, the Tswana, use 126 separate plant species and 100 animal species as food sources (Grivetti, 1976). Malaisse (1985), cited wild leaves, either fresh or dried, are one of the most widely eaten forest foods. Typically they are used as a base in soups, stews, and relishes which traditionally accompany a carbohydrate staple. This combination is important because as well as providing nutrients these wild leafy vegetables add flavor to otherwise bland food, and encourage greater food consumption. Moreover, leaves are an important part of traditional diets in many parts of Africa. In upper shaba, Zaire, for example, it was found that leaves from 50 different tree species were eaten. Generally the non-destructive nature of NWFPs harvest, support sustainable management of forest resources and conservation of biodiversity, their contribution to socio-economic welfare of communities living in upland, watershed areas amenability to integration with management objectives, allow controlled

extraction of NWFPs ecotourism, recreation and other services which are environmentally sound and safe which can generate income especially in managed areas, they provide linkage to forest biogeochemical cycles and food system and their ability to incorporate both economical, ecological objectives (FAO, 1995).

1.2. Statement of the problem

The world's forests are being cut and burned at rapid rates that if action is not taken soon people risk undermining their vital function in maintaining a habitable planet. Already forest loss is contributing to extinction of plants and animals, increased flooding and disruption of climate patterns. In parts of the world forests decline adds to people's social and economic distress particularly the natural forest in semi- arid Africa were disappearing at rapid rates, because of the need for new agricultural land and, to some extent, also for fuel wood.

Sudan's long historical conflict has had significant impacts on its environment. Indirect impacts such as population displacement, lack of governance, conflict related resource exploitation and underinvestment in sustainable development has been the most sequences to date. On other hand environmental issue have been and continue to be contributing cause of conflict. Competition over oil and gas reserves, Nile water, and forest's products, as well as land use issue related to agricultural land important positive factor instigation and perpetuation of conflict in Sudan. It is frequently emphasized that detailed and systematic data about NWFPs natural resources is lacking. Also the lack of ecological data base specific constrain facing the contribution of NWFPs to sustainable rural development are very little quantitative data available on production and value of NWFPs, lack of research and information on ecology of species, management practice, post harvesting and processing technologies, market opportunities, quality requirement and controlled fluctuation, lack of clear and appropriate

legislation and policy support. In Sudan research on NWFPs is limited, socioeconomic researches are even scarcer and related to Gum Arabic.

ElRahad locality of North Kordofan State had selected to highlight this problem

1.3. Objective s of the research

The general objective of this study to investigate the contribution of NWFPs to the sustainable livelihood of household in food security, confines its focus in El Rahad in North Kordofan State. The study covers some NWFPs excluding Gum Arabic.. The specific objectives of the research are:

- To highlight the impacts of reliance on some NWFPs for income generation.
- To determine the time calendar of some NWFPs in terms of time of collection and marketing.
- To identify the different stakeholders engaged in NWFPs collection and marketing.
- To identify the uses and importancet of NWFPs .
- To determine measures of risks confronting development of NWFPs markets.

1.4. Research Questions

Some Questions were formulated to cover the research problem and help in attainment of the stated objectives, namely;

- What is the role of NWFPs in income generation?
- What are the suitable times for collection and marketing of most NWFPs in Um Rawaba locallty?
- Who are the stakeholders engaged in collection process and marketing of NWFPs?
- What are the uses of NWFPs?
- What are the measures of risks confronting NWFPs at the study area?

CHAPTER TWO

LITRETURE REVIEW

2.1 Non – wood Forest Products

In resent years, NWFPs have attracted considerable global interest. This is due to the increasing recognition that NWFPs can provide important community needs for improved rural livelihood; contribute to household food security and nutrition; help to generate additional employment and income; offer opportunities for processing enterprises; contribute to foreign exchange earning and support biodiversity conservation and other environmental objectives (Arnold, 1995). Tree and forests contribute in many ways to combating malnutrition and improving diets in local communities and rural household. Not only do they directly provide food and medicines, but they also indirectly increase income and improve agricultural production, thereby improving access to food. Hunger and malnutrition would be significantly worse if it were not for the contribution of trees and forests to household food security (Arnold *et. al.*, 1994). Forest foods can offer vital insurance against malnutrition or famine during time of seasonal food shortage or emergencies such as droughts, flood or wars. It is common for rural households to depend on forest food between harvests, when harvested stocks have been consumed but before new crops are mature. Women, in particular count on these resources for supplementary nutrition, emergency foods, fuelwood for cooking and many other important products they need to ensure the nutritional well-being of their family (Barraclough, 1995).

2.2. Non Wood Forest Products and food security

Probably the majority of rural households in developing countries, and a large proportion of urban households; depend on plant and animal products of forest to meet some part of their nutritional, cooking and/or health needs. There is wealth of wild fruits and flowers that has great potential for local use as well as commercial development. Trees and forests contribute to improving the well-being of local populations by providing of food, flavorings medicines

and beverages (Becker, 1986). In fact, it can be said that nearly every tree, shrub or grass species is used in one way or another for food and nutrition. Plants provide food either directly in the form of fruits, seeds and other edible parts, indirectly by providing products that facilitate consumption of other foods. Wild food plants can also play crucial role in supplying essential nutrients especially during times of acute and chronic food shortages (Clay, 2000).

The contribution of forests and trees to food security in Africa is significant, diversified and valuable; it ranges from direct production of food to provision of jobs and income. Wild food plants complement food intake and are consuming throughout the year. Edible plants, plant products, and medicinal plants are considered as the most important NWFPs (Chandrasekharan, 2004). NWFPs are first and foremost used for food and medicinal purposes. They serve as important protein providers especially for rural people. The leaves and roots of edible plant have high nutritional value and can play an important role in prevention of mal nutrition in rural areas. Beyond this, they represent a source of income for a large number of people, especially women, who are the main traders of NWFPs (Fleuret, 2007). Also in recent years forests have been increasingly as rich reservoirs of many valuable biological resources, not just timber. The term (NWFP) emerged as an umbrella term to recognize the products derived from these various forest resources as a group (FAO, 1995). NWFPs consist of goods of biological origin other than wood, as well as services derived from forest and allied land uses. This definition is intended to encourage better accounting of NWFPs, of both plant and animal origin, as a group and their contribution to national economic indexes which policy – makers use to decide development priorities and policy.

2.3 Importance of NWFPs

Through the experience of forest communities, forestry professionals have recently rediscovered the great importance of NWFPs (ranging from food, fruits and fibers, dyestuffs, flavors and medicines) for meeting people's needs

without destroying the forest resource. Why have modern science and governments over looked the importance of this non – wood forest wealth for so long? First, most of these products are used mainly for rural subsistence or local markets. They often go unrecorded in official statistics which focus on nationality traded goods (Chandrasekharan, 1994). Second: because modern government administration has divided these products among forestry, agriculture and horticulture, statistic do not recognize even nationality and internationality importance of NWFP commodities as originating from the forest. Finally: modern forestry has favoured timber and large scale enterprises, and has generally regarded non – wood products as incidental. However, studies show that forests produce many more types of products than wood products particularly in some topical forests (Toledo *et.al.*, 1992). Small-scale forest – based enterprises in Zimbabwe that, mostly are based on NWFPs , employed 237.000 people in 1991, compared to 16.000 employed in conventional forestry and forest industries for the same year (Arnold *et. al.*, 1994).

2.4 Identifying target and indicator groups

These products are particularly important in relieving the “hunger periods” in agricultural cycle and in smoothing out other seasonal fluctuates. Dealing with NWFPs can provide employment during slack periods of the agricultural cycle, and provide a buffer against risk and household emergencies. Poor household, in particular, depend on these products for their livelihood because they usually have more access to forest than the other resources. For the same reason—greater dependence on open—access forests, for lack of other options – women usually rely more than men on NWFPs for household use and income (Moser and Kalton, 2007). In many places women are responsible for household activities that involve forest – based foods and medicine, as well as fuelwood. In this respect NWFPs are particularly important to women, addressing their needs for food security and nutrition. In local, urban, national and international markets, forests foods and medicines contribute

substantially to national economic growth (Ogendo, 1990). NWFPs are therefore important to three main groups (Rahama, 2005):

- Rural populations (the largest group) who have rationally used these items for livelihood and social and cultural purposes;
- Urban consumers (smaller group, but growing faster) who purchase these items
- Traders, and product processors, whose numbers in the NWFPs sector increase as urban market for these products grow.

To optimize equity and stability, the managers should consider how proposed activities would affect these groups. Despite the fact that women tend to depend more on non wood resources for household use and income than men, they frequently have less voice in resource management decisions than men, and their priorities are over looked. In Latin America women have large roles in hunting using certain technologies (nets, basket traps and poison fishing) but not in others; in some societies; women are the ones to identify and track animals (Snedecor & Cochran, 2006). Assessment of local NWFPs use should recognize these variations and make special effort to include women and address their needs. Other groups that tend to rely heavily on forest products for food and other subsistence needs include (FAO, 1989):

- The landless poor, who often depend on common property resource for fodder, fuel, handicraft materials and other needs;
- Forest dwellers and shifting cultivators, who frequently lack secure land tenure and are squeezed out when pressures increase on forest resources;
- Small – farm families who may lack resources for subsistence production, and who experience declining fertility and shrinking farm-size through inheritance.
- Pastoralists and herders, who are vulnerable to droughts and encroachment by cultivators and government programmes;
- Young children, who depend on forest snacks for certain vitamins.

2.5 Some selective indigenous fruits and related forest material

Forests and wood lands have always been major sources of fruits and medicines for human. Local communities collect wild fruits from forests to supplement nutrition, particularly during famine or in the event of natural disaster (Eyog-Mating *et. al.*, 2002). Wild fruits contain vital nutrients and essential vitamins which are important, especially for growing children; who are prone to malnutrition and related diseases. The range of wild fruits in Africa is quite large and diverse and varies according to prevailing ecological conditions of given area. Within the humid tropical forests they form part of complex biodiversity. Fruit bearing trees for a given species are usually few and scattered within the forest. They are normally collected and consumed at subsistence level with few entering local markets. However, some like bushmango and bushplums, are article of commerce in national, regional and even international markets (Tubuna, 1999). In the sub-humid and dry land zones fruits trees are found in patches, sometimes occurring as diverse stands and some have become articles of commerce in local, national or even regional markets; some key fruit which present valuable learning points for suitable management of forests and wood lands. Among indigenous or naturalized fruits with commercial potential in Africa are: *Tamarinds indica* (tamarind “Aradeeb”), *Zizphus mauritania* (Nubg/Sidir) *Adansonia digitata* (Gongleze) (tabildi).

2.6 Forest medicines

Traditional medical practices in Africa, like in many developing countries, are wide spread and deep rooted ,. Most medicines are from plants with majority coming from forests and allied ecosystem for example more than 3-5 billion people in the developing world use plants for their primary health care with more than 35,000 species being used (Balick and Alancox, 1997; Vanseters, 1997). Approximately 3,000 plants in South Africa used as medicines, 350 of which are commonly used and traded (Vanwyk *et. al.*,

1997). The number and diversity of medicinal plant species originating from African forests is large enough to make a topic on its own.

Use of medicines from the forest often overlaps with forest food use. People add certain items to food for the dual purpose of improving taste and adding health tonic properties (Vogt, 1995). These uses are closely linked to cultural values, and integrate traditional and western style medicine. In Ghana people in one study regarded disease as caused by either (natural) or super natural) problems, using western medicine for natural illness and traditional cures for super natural problems. The use of forest products for medicinal and other health purposes is very wide spread. Very large number of forest plants, and often some animal products, are frequently used within a single community (Davies and Richards, 1991), and some medicinal plants were observed in location in Vanuatu (Olsson, 1991). Even in the relatively species – poor forests of west Bengal, 47 species have been recorded as being used in 42 villages (Malhotra *et. al.*, 1993).

Medicinal usage tends to overlap with that of forest foods. There are also often strong links between medicinal use and cultural values. Use of plant and animal medicinal products generally lessens as people move to towns, and in situations where changes in attitudes and practices favour more reliance on modern medicine, where supplies have become scarce or costly, and where knowledge of traditional uses has declined (with fewer or less effective traditional healers). But the striking feature emerging from contemporary studies is high level of continuing use of traditional medicines in most situations.

2.7 Bee keeping and honey production

Honey and bee wax are two important NWFPs that have strong relationship with plants. Honey bees derive the nectar and pollen they need from a wide range of vegetation types. In natural environment forests woodlands and bush lands are major source of nectar and pollen, which made traditional

beekeepers acquire a profound knowledge of trees and other plants that bee depend on. Beekeepers have highly developed sense of time and orientation with respect to seasonal beekeeping floral calendar. They aim to make optimum use of available flowering trees and they will consider supplementary species where required to bridge flowering gaps in calendar. Many lists published of valuable species melliferous trees, some within multiple uses (Svensson, 1991 & Scrapper, *et. al.*, 2000).

Forests are also important source of materials used by beekeepers. Most modern hives are made of sawn timber while those used in traditional set up are assembled out of bark, logs or other locally available types of plants or soils. Tools are fitted with wodden handles obtained from trees and shrubs, particular plants also supply materials for lighting smokers. Other plants provide the scented leaves used for rubbing on the inside of empty hives in order to bait swarming colonies. Tree also provides much needed shade for keeping hives cool under hot tropical climatic conditions (Svensson, 1991). The relationship between the beekeeper and trees thus acquires such importance at times those trees come to regard as personal property. In sensitive and want on exploitation of forest thus poses a serious threat to beekeeping. Beekeepers need recognition as major stakeholders in forest conservation and should be involved more deliberately in sustainable forest management. Bees are responsible for the pollination of many flowering plants and are therefore important in sustaining biodiversity (Hertz, 2002).

2.8 Cultural values related to NWFPs

Rural people use NWFPs for food, income and farm inputs but also for social, cultural and religious functions. The intangible, non-economic roles of NWFPs can be more important and even provide a foundation for economic roles that development programmes usually address (Reis, 1995). Certain species may play a crucial role in spiritual ceremonies, or have taboos associated with them that forbid certain harvests. In central Africa, parents plant a tree in the wild for a new born child, and the child's growth is forever

linked to the tree's growth (Falconer, 1990). Forest food plays a part in wedding rites, initiation ceremonies and other events. In many places, these cultural and spiritual role are losing their importance, but in other places they persist and are even renewed in the face of encroaching values from out side the community (Olsson, 1991).

2.9 Household Subsistence

Among all the many NWFPs, the most common world wide is used for food, fodder, medicine, and construction materials. Other uses include among others, farm tools, household baskets, sleeping mats, pillows sponges and brooms. Rural families provide for their needs not just by growing crops but also with other household income. Therefore assessments of local dependence on NWFPs for food security must count local product sale as well as direct contribution to food and nutrition. A family often changes its strategy for food security as its economic options change. This can have varying effects. For example, more labour – intensive harvesting methods for a product could force women to spend less time cooking and caring for their children (Arnold, 1995). Foods from forest include fruits, seeds and nuts, tubers and roots, fungi, gum and sap, beekeeping for honey is often a forest based activity. Wildlife is important source of food, particularly in Africa. In West Africa, more than 60 wildlife species are commonly consumed (Falconer, 1990). In parts of Africa, bush meat provides a major source of protein to people's diet. Smaller animal and invertebrates are more important food sources than larger game (FAO, 1995).

Within a single community, different groups rely on forest food to varying degrees, poor and landless people often depend more heavily on forests foods than others. In many areas, children tend to snack on forest fruits and seeds compared to adult. This variation is important for gauging local resource use. Identifying key indicator groups that depends most heavily on NWFPs provides a tool for monitoring resource availability. Gender and other variables also influence the processing of forest and tree foods. All family

members might help with collection, but usually it is women who are responsible for processing these items. In south west Nigeria for example, women process *Parkia beans* palm oil and soap (Vogt, 1995).

2.10 Seasonal importance of foods from forests

Forest and farm trees are most extensively used to help meet dietary short falls and to supplement household income during particular seasons in the year. Many agricultural communities suffer from seasonal food shortage generally known as “hunger periods”. They commonly occur at the time of year when stored foods supplies have dwindled and new crops are only just beginning. During this period the consumption of forest and tree food increases (Walsh *et. al.*, 1992). In many areas the consumption of wild animals and fish is also highly seasonal. Forest and farm tree products are also valued during the peak agricultural labour period, when less time is available for cooking and people consume more snack foods. On the other hand, some favored forest foods such as snails, mushrooms and honey have particular harvest seasons that do not necessarily correspond to food short periods. In these cases, food is gathered for as long as it is available (Raintree and Francisco, 1994).

Home gardens (intensively managed farm systems combining tree and herbaceous crops) are widely designed to make use of variations in timing of the harvest of different component tree crops, in order to supply foods and saleable produce during the period between harvests of staple crops. Another important feature of such gardens and other systems incorporating is that work on the latter can often be under taken during the slack season, this helping to even out the peaks and roughs in the demand for farm labour (Reis, 1995).

2.11 Changes in consumption of forest foods

Changes in the role that forest food plays in household nutrition may reflect penetration of rural markets by new food products, changing tastes, or

decreased availability. However, decreased availability may reflect changes in the availability or allocation of household's supply of labour rather than physical shortage of the product. As the value of labour rises with increasing wealth, the opportunity cost of continuing to spend time gathering foods, rather than purchasing them, becomes increasingly unattractive. In areas where rural populations have achieved high incomes and easy access to purchased foods use of forest foods is likely to be very little (Kangas and Markkanen, 2001).

Some studies indicate that emergency uses of forest resources are dwindling as people rely to a greater extent on food purchasing, or as famine relief program become more effective. In others important supplies of food crops have diminished the need to depend on forest foods. In Vanuatu, for instance, the introduction of sweet potato, which could be planted at any time and produce an edible crop within three months, and manioc, which can be left unharvested for up to two years, has made the traditional emergency foods of wild taro, arrow root, wild yams and sago virtually obsolete (Olsson, 1991). Many studies report that a decline in use of forest food accompanies reduced knowledge about its use. As children spend more times in school than in the fields and the bush, the opportunity to learn about wild foods reduced. Decentralization is another wide spread change that distances restrict people from the foods sources they used to be familiar with (Melnik, 1993).

Another wide spread trend affecting rural consumption patterns and levels in the diversion of food available to rural households to burgeoning urban markets. This has been reported to be the case with bush meat in the forest zone Ghana (Falconer, 1994); in many cases the loss of regular supply of bush meat has not been replaced by domestic meat, but has simply meant that less animal protein is consumed. Forest fruits in parts of the Amazon form another example (Melnik, 1993). It is often the poorest, who are forced to exploit this source of income because of lack of attractive opportunities, which are most likely to suffer nutritionally from this diversion of food supplies. The

importance of declining consumption of forest is not clear. In some cases these changes do appear to have led to a poorer quality diet; most notably as greater reliance on purchased food reduces dietary diversity. But greater reliance on the latter does not necessarily result in adverse nutritional and consequences. Perhaps the worst impact is that poorer people's food options are being progressively reduced, especially during seasonal and emergency hardship period (Falconer, 1989).

2.12 NWFP Use in house construction

Much house construction in the rural areas in developing countries involves use of forest products. Although much of this is use of timber for door frames and poles for the frame of mud walls, this frame is typically bound together using canes, lianas, raff as or twines made from other fibrous plants, and roofs are commonly covered with grass, bamboo, reed or leaves. Where it is available, bamboo is heavily used. It is reported that in Bangladesh over 70 percent of rural dwellings use bamboo as prime building material (Wells *et, al.*, 1994). A recent review study notes that such usage is closely associated with poverty. There is substantial evidence pointing to the fact that fast majority of households in the rural areas build with unprocessed organic materials because they are available at little or no cost often gathered free of charge from the householder's own farm or from forest land common lands.

In another study considerable evidence of growing shortages of such materials and of changes in building practices and usages, was but reported that it is difficult to determine to what extent the latter is a response to increasing difficulties obtaining subsistence or low cost supplies, rather than other factors, shifts to mud brick walls and corrugated iron roofing or roof tiles are frequently reflections of increased income, moves to upgrade the household's dwelling, or shifts in attitudes towards housing rather than the result of shortage of poles, bamboo or thatch (FAO, (1991). "Modern" house can offer a number of advantages to offset their higher cost including longer life. Change to building practices that require less labour can reflect reduced

availability of labour rather than growing shortage of cost of the previously used building material (Wells *et. al.*, 1994). Nevertheless, there is evidence of practices that clearly represent a loss of quality, or deterioration in housing standards for those concerned as biomass construction materials become more difficult to obtain. These include reduction in size of the dwelling as materials supplies tighten, use of less durable species so that dwellings have to be replaced more frequently, and less frequent – ret hatching and maintenance of existing structures so that their condition deteriorates (Davies and Richards, 1991).

2.13 Forest products and household incomes

Employment and income from small scale non – farm enterprise activities are nearly everywhere becoming of growing importance in rural economy of developing countries. In stagnant or slowly growing agricultural areas small enterprises activities provide employment to surplus labour; in conditions of growing agricultural incomes they contribute to the process of growth diversification and the shift to more productive uses of rural resources (Haggblade and Liedholm, 1991). It has been estimated that rural non-farm work provides 20 – 45 percent of full time employment in rural areas and 30 -50 percent of rural household income (Kilby *et. al.*, 1989). As was noted earlier, results of surveys of the small enterprise sector have shown that small forest products activities every where account for a substantial proportion of the total (Liedholm and Mead, 1992).

Characteristically, forest – products activities form only one part of a household enterprise, in Zambia 64 percent of those enterprises operated by persons previously in farming were found to be run in conjunction with farming and 30 percent of them with one or more other small enterprise activities. Of those where enterprise activity is the principal one, 56 percent also farm and 65 percent have other activities in addition to the forest based (Fisseha & Milmo, 1986).

2.14 Importance of forest products in meeting household income needs

Income earning activities based on marketable forest products may be seasonal or year – round, or may be occasional when supplementary cash income is needed. The role of these forest products activities varies depending on the availability and profitability of alternative employment, the seasonal availability of the forest products, the need for cash income, access to the forest resource, the composition and condition of the forest resource, and access to markets (Beerad Me Dermot, 1989 ; Falconer and Arnold, 1989).

The forest-based activity may be the sole or principal source of income. Rubber tappers in the Brazilian Amazon provide an example where this was until recently the case with a gathering activity. Sale of forest produce is also the principal source of income in many engaged in hunting. In the villages around the Korup National park in Cameroon it was found that hunting is the single most important source of cash income for majority of village households and for the village as a whole (Infield, 1988). The larger and more profitable processing activity – in a study of six countries in Africa it was found that nearly half of those engaged in wood working reported it as being their sole source of income, and more than 60 percent it was their main source (Arnold *et. al.*, 1994).

More widely, forest based activities are engaged in part – time by farm household which can not raise enough to be food – sufficient year around. A study of low land village in the Philippines found that 73 percent of households could not generate enough food or cash income from agriculture to meet their basic needs. All village households collected forest products for supplementary and emergency income; with more than half depending on rattan collection and timber wage – labour as a primary source of livelihood. The average earnings from rattan collection were greater than average wage for agriculture or timber production labours (Siebert, 1985).

2.15 NWFPs Use and the National Economy

The importance of NWFPs at the national level lies in the huge numbers of people involved in gathering, hunting, processing, trading and other aspects of their productions. As noted earlier, most rural people use some forest products and many obtain part of their income from forest – product activities (Davies and Richards, 1991). The lack of information about the numbers involved in subsistence use, or about the value of that use at the household level, makes it impossible to arrive at even rough estimates of the economic contribution of that component of production and use. Somewhat more information is available about employment in income – generating activities. Results from small enterprise surveys in six countries in southern and eastern Africa indicate that an estimate of 408,000 forest product enterprise activities provide employment for 763,000 persons as an average density of 16 persons per thousand in the population (Arnold *et. al.*, 1994).

Most households exist in a situation within which their activities are influenced by an array of interrelated objectives, constraints, and other factors. Household's livelihood strategies are likely to include pursuit of secure provision of food and other essential subsistence goods, cash purchase of outside goods and services, savings, and social security. Other factors are likely to include concern to reduce critical risk factors, and local social, cultural and spiritual considerations social and cultural context (Davies and Richards, 1991). Forests and forest products are linked to household livelihood system in a variety of different ways. Forest commonly contribute to meeting food and other basic needs, are a source of income and inputs into agricultural system, help households control exposure to risk of various kinds, and constitute an integral part of the habitat of the social and cultural structure of those living within that environment (Falconer and Arnold, 1991).

2.16 Plant gums, resins and essential oils

Plant gums are usually water soluble compounds made up of polysaccharides and small quantities of protein and mineral salts (cations). Plant gums from

trees are of two types: exudates (ooze from the tree/shrub as a result of injury) and seed gums (isolated from the endosperm portion of some seeds) ¶ Exudate gums are the main forms produced in Africa. The two most important commodities are gum Arabic and gum karaya. Gum Arabic is a dried exudates obtained from stems and branches of *Acacia Senegal* or *Acacia seyal* (FAO, 1998). The two species are native to hot and dry regions of Africa. *Acacia Senegal* exudates is found in a belt some 300 km wide immediately south of the Sahara desert from Mauritania and exudates in the west to the Horn of Africa (Giffard, 1975). From the Horn of Africa, it extends south wards through Tanzania to Southern Africa countries of Angola, Namibia, Zimbabwe, Botswana and South Africa (Natal and Trasvaal), *Acacia seyal* extend from Dakar in Senegal to the Horn of Africa and south wards to Tanzania (Hall and Mc Allan, 1993).

Gum arabic is an ancient product that is obtained from the African dry lands for several millennia. It has also remained an important article of commerce to the present day. In terms of production, Sudan is the principal producer accounting for over 50% of the world production. Management of the resources for gum production will develop and clearly demonstrate how forest can be sustainably managed. Over the year, farmers have developed an agroforestry system known as gum garden in which gum trees are grown on farm plots at space of 4x4 meters. During the first 4-5 years, agricultural crops are planted between the lines there by supplying the farmers with food. The *Acacia* trees are also nitrogen fixing and hence improve soil fertility. Gum production begins at around year four and continues annually until the trees are twenty to twenty five years. Mean while, animals are allowed to graze wider the trees when they have grown big. The trees are then harvested for wood fuel and other farm activities. The land is then left fallow for some time and the cycle is repeated. This system ensures optimum and sustainable use of natural resources since crop production during initial years and gum production and livestock grazing form productive component (Badi, 1993).

Gum karaya is a gum exudate obtained from tapping of *Sterculia setigera*. The species is found in Sudano-Sahelin zone from Senegal to Sudan. Commercial production is taking place in Senegal, which is the world leading exporter (around year). India was leading producer and exporter until the mid 1990s and it is believed that large quantities are consumed locally where domestic consumption is about double the volume exported (Coppen,1995). Africa has a lot to learn from India with regard to tapping, sorting and grading. Plant resins are solid or semi solid materials which are insoluble in water but soluble in certain organic solvents. The resins found in Africa can be classified into two categories: oleo – gum resins and oleo – resins.

The term oleo–gum resin means that the product contains an essential oil component, a water-soluble gum and alcohol soluble resin. Oleo – gum resins are representant by myrrh and frankincense which, like gum Arabic, are ancient commodities that have remained important articles of trade to present day. Myrrh is an exudate production from *Commiphora myrrha*, a species confined to Horn of Africa in Ethiopia, Kenya and Somalia (Chikamai, 2002). Outside Africa, it is found in Arabia, Frankincense (Incense) is exudates from species in genus *Boswellia*. There are eight species of *Boswellia* found on the Horn of Africa. *B. sacra* and *B. frereana* from Somalia produce the most valued incense in the world. Incense from *B. papyrifera* from Eritrea, Ethiopia and Sudan is most widely traded while incense from *B. neglecta* is produced in commercial quantities from Ethiopia and Kenya but traded mostly within the sub-region.

Ethiopia, Somalia and Kenya are the three leading producers and exporters of myrrh and Frankincense. Virtually all the resources are natural stands except in a few cases in northern Ethiopia where the *Boswellia* species are being used in the rehabilitation of degraded sites. In areas where commercial production is well established, there exist a form of natural resource management based on indigenous knowledge. Although land is owned communally, clans within the Somalia community have responsibility of

managing resources within the areas of jurisdiction, which is well respected (Chikamai and Kagombe, 2002). Myrrh or incense trees are protected from felling by local rules and regulations – only the dead and/ or dry are cut. Myrrh production through tapping is also well organized by the “Malmaleys” i.e. myrrh (malmal) tappers (Chikamai and Ordera, 2002), system that ensures sustainable production from resources. Oleo – resin or resin from pine plantation is being produced from four countries in Africa: South Africa, Kenya, Zimbabwe and Uganda production is fairly recent having started in Zimbabwe in 1976, Kenya and south Africa in 1986 and Uganda in 1994 (Coppen and Hone, 1995). The principal producing species are *Pinus elliottii* in Zimbabwe and *Pinus elliottii* and *Pinus caribaea* in Kenya and South Africa. *Pinus radiata* is also tapped for pine resin in Kenya. In Uganda *Pinus caribaea* is the main species. There exist good prospects and potential for commercial production in Malawi from *Pinus elliottii* and *Pinus kesiya*, Zambia from *Pinus merkusii* and *Pinus kesiya* and Tanzania from *Pinus elliottii* and *Pinus caribaea* (Coppen, 1995)

2.17 NWFPs as abasis for sustainable forest management

NWFPs, by complementing wood based management, offer a basis for managing forests in a more sustainable way. In fragile ecosystems, NWFPs activities hold prospects for integrated forms of development that yield higher rural incomes and conserve biodiversity while not competing with agriculture (Sharma, 1995). An important concept in realizing these prospects is adding value locally, usually through some form of rural processing, to ensure that a fair portion of product’s market value accrue to people who manage the forest resource. Local participation is important for sustainable management for several reasons:

1. To recognize the full extent of local demands on forests resources;
2. To fully consider the local knowledge of the resource that has developed over time.

3. To engage nearby communities as stakeholders in managing the resources, ensuring their commitment to long – term management goals.
4. To engage the energies of local people in their own economic change, which can include decision on social and cultural priorities that outsiders do not realize.

CHAPTER THREE

STUDY AREA

3.1 Location

North kordofan State lies between Latitudes $11^{\circ} 15' - 16^{\circ} 45' N$, and longitudes $27^{\circ} 50' - 32^{\circ} 15' E$. Fig (3.1) shows the map of the study area. It share border with North Darfur from the north-west, Northern States from the North, Khartoum State in the East, White Nile State in the South – East, South Kordofan State in the south and recently part of the former West Kordofan State has been added to the area of North Kordofan. North kordofan State is composed of nine localities with a total area of 24.612 million hectares (Planning and Information Administration 2006).

3.1 Administrative structure

North Kordufan State is composed of nine localities namely: Sheikan, Bara, Umm Rwaba, Annuhud, Gubeish, Abu-Zabad, Wad-Banda, Gabrat Al sheikh and Sodari. Al Obeid city is the capital of the state. Um Rawaba locality (study area) is composed of nine administrative units: city, Rural of Umm Rwaba, Al Rahad city, North Al Rahad, South al Rahad, Wad Ashana, shirkeila, Umm Dam and Muzdalifa. Um Rawaba lies in the eastern part of North Kordofan State, between Latitudes $12^{\circ} 30' - 12^{\circ} 45' N$, and between Longitudes $30^{\circ} 50' - 31^{\circ} 45' E$. It is adjacent to White Nile State (Tendelti and Al Doeom) in the East, Sheikan Locality and part of Bara locality in the West, South Kordufan (Rashad and Dilinj) in the South, and Bara Locality in the North. The area of Umm Rwaba Locality is 24610 km², 30% of this area is used for agricultural practices. The main tribes in the locality are Gawamaa tribes who intermingled (intermixed) with some other tribes in living and breed (Planning & Information Administration 2006).

3.3 Climate

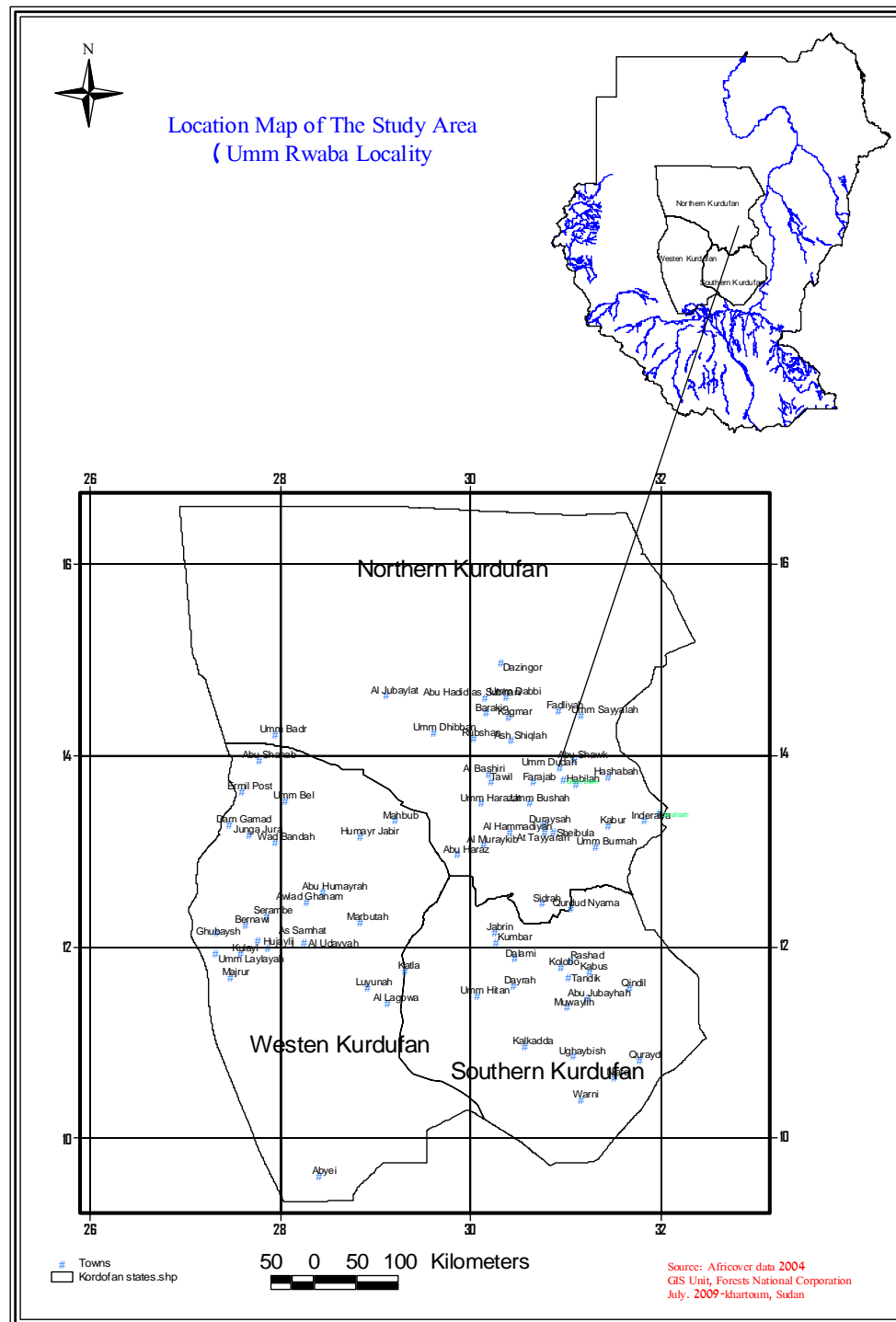
North Kordufan State is characterized by different and numerous climatic zones in which the climate can be categorized into the following (Planning & Economics Admin. 1991):

- The desert area: Rain fall amount is low (Less than 100 mm. per annum) and it lies in anarrow strip in the North-West part of the state which includes part of Sodari Locality.
- The semi-desert area: Rainfall amount is between 100-225 mm. per annum and it includes a great part of Sodari locality and the North-East part of Bara Locality.
- The arid zone: Rainfall amount is 225-400 mm. per annum. It includes Bara Locality, north Um Rawaba locality, Annuhud Locality, and the far part of Sheikan locality.
- The semi-arid zone: Rainfall amount is between 400-750 mm. per annum. It includes Sheikan, Umm Rwaba in North Kordufan, Al Fula and part of Diling and Rashad in South Kordufan Localities.

Rainfalls are seasonal, erratic in quantity and distribution. In the rainy season of 2006, the annual average exceptionally doubled; however, the trend for next seasons remains precarious. The rainy season starts in May and continues to October with peak in August (UKRDP 2001). Rainfall quantity and quality have deteriorated over the years. Average annual rainfall has decreased and distribution has worsened as indicated in table (3.1). The temperature is high all years around except during wintertime (Nov. – Feb. – March) maximum temperature is about 42 °c during May.

Drought cycles take place every 3–5 years. The study area is highly affected with the patterns of climate change and variability, particularly frequent drought and sporadic nature of rainfall. Drought is a common unwelcome visitor to the study area and it induces several negative impacts. These impacts are apparent in the period between 1983 and 1992, which dexterously affected the natural resources in the State.

Fig. (3.1) Location Map of the Study Area (Um Rawaba Locality)



Source: FNC, 2008

Table (3.1) Annual rainfall (mm) by town

Year	Total Annual Rainfall	
	Um Rawaba	El Rahad
1984	NA*	NA
1985	NA	NA
1986	219	NA
1987	269	NA
1988	275	291
1989	329	190.3
1990	185	133.9
1991	386	219.8
1992	390	302.8
1993	435	276.8
1994	370	315.5
1995	315	357.3
1996	347	358.1
1997	328	557
1998	418	NA

Source: Save the Children, (1988)

* NA (not available)

3.4 Soil type

Soils in North Kordofan are divided into four major groups (Classes): sand dunes (Qoz) soils constitutes 55% of the agricultural lands and the "Gardoud" soils which represent 20% of the soil in the state and the sediment soils in Khor abu habil basin and the "wadis", these constitute 15% of the soil and lastly the cracking clay soils group that constitute the remaining percent (10%). Um Ruwaba province lies within the goz belt, which is part of a narrow strip of sandy soil running along the southern side of the sahara across Africa. The stabilized sand of the goz soil is poor in minerals and organic matter and has low clay content (5-20%). Clay soils are found in the southern part of the district and between sand dunes; Dark heavy clay soils are prevalent in and around seasonal rivers. Their clay content exceeds 60% and these highly plastic soils crack in the dry season.

3.5 Vegetation

Acacia senegal (Hashab) is one of the dominant species that occur naturally in the State. It is found in different soil types either naturally or in plantations

that were established by different forestry projects. The most dominant associated tree species are: *Acacia raddiana* (sayal), *Faidherbia albida* (haraz), *Adansonia digitata* (tebeldi), *Zizphus spinachristi* (nabag), *Balanites aegyptica* (heglig), *Acacia millifera* (kitir), *Boscia senegalensis* (mukhit), *Cadaba flandulosa*, *Cadaba rotundifolia* (kumut), *Tamarindus indica* (aradie), *Azadirachta indica* as plantation tree (Neem) and *Calotropis procera* (usher) grows around many villages where soils are exhausted and unfit for cultivation of crops. The production of the state from Gum Arabic equals 50% of the total production of gum arabic in Sudan. Gum Arabic is a corner pillar for the national economy. The total area of the North Kordofan State conserved forests are about 7937506.387692 hectares while the total conserved forest of Um Rawaba locality was 35645.904 hectares, the total number of the conserved forests of Um Rutabaga locality is 31 forests. (FNC, 2008).

The understory vegetation is dominated with several grasses and herbs. The most important species are: *Aristida spp.*, *Evadrostis tremula* (banu), *Cenchrus biflorus* (heskanit), *Cymbogon nervatus* (nal), *Sorghum pureoseicum*, *Auysicarpus rugosus* (sheleeni), *Amarathus spp.* (lisan eltair).

3.6 Population

The total population of North Kordofan State was 2424450 according to the last census 2007, while the population of study area (Um Rawaba Locality) was 583087 according to 2007 (Statistical Census, North Kordofan, 2008). The majority of the inhabitants of the study area are belongs to Gawama'a tribe with prevalence of some other tribes as minority. The rural population in the state represents 67% of the population and the urban population percent is 13% and the nomads' equals 20% (FAO, 2006). Table (3.2) shows the Population of the study area.

Table (3.2) Population of the study area

Locality	Administrative	Population 2007
Um Ruwaba	Um Rawaba Town	53243
	Rifi and Wasat Um Rawaba	176829
	North Um Rawaba	120973
	Wad Ashana	90377
	Rifi and El Rahad Town	141664
Total		583087

Source: North Kordofan Census 2007

3.7. Water resources

Rainfall is the main source for water in the NKS state. The state receives the surface runoff water from Nuba Mountains and storage in natural depressions (hafirs, Foula or rahads). Wadi Al-Magadam, Wadi Al-Malik, and Khor Abu-habil & its tributaries are the main seasonal water courses that trespass the state. In addition to surface or rain water, underground water is found in Bara which is described as an underground lake, and Um Rawaba city which is famous for clean mineral water.

The state is characterized by prominent and distinguished large water surfaces like "Turdat" Al-Rahad with a potential of 50 million m³, and "Turdat Bara. The state is characterized by a high potential rate of ground water typically in Umm Rwaba and Bara basins. Surface water is also found, for example in Al rahad and Um Badir depressions (Save the Children 1988).

3.8 Economical activities

Agriculture is practiced as a major activity for living beside animal herding and commerce (Trade) in Sheikan, Umm Rwaba and Bara localities. Animal herding is common in Gabrat Al-Sheikh and Sodari localities through shifting pastoral life (Planning and Investment, 2000). Agriculture is the main occupation for rural population and it is distributed in extensive areas. The sandy soils are dominant soils and in some areas the "gardoud" soils and clay soils are found in Abu-Habil khor banks and Al-Rahad "Turda". The area of rain-fed agriculture is equal to 1.68 million hectares and the irrigated area is

6930 hectares. The important agricultural crops are: Sorghum, Millet, Sesame, Hibiscus, Water-melon, and the no-wood tree fruits and exudates e.g Tebeldi, Aradeib, Goddeim and Gum Arabic. Some horticultural and vegetable gardens are found in small scale in Al-Rahad, Bara, and Al-Ban Jadeed localities in Al-Obeid Town..

A high rate of animal wealth is found at the borders of the state, and natural meadows are abundant. The number of livestock is estimated as 5 million, camels and sheep comes at the top then cows, goats, donkeys, horses and chicken come below. Veterinary services are available all over the distribution centers of animal wealth. As most of cities in the country, North Kordufan state is known as a light-industry state especially food oil industry which comes first of all other industries. The number of oil mills is 43 factories distributed in Al-Obeid, Umm Rwaba and Al-Rahad, in addition to soap, printing, covering, plastic, furniture and other minor hand industries.

CHAPTER FOUR

METHODOLOGY

4.1 Introduction

This chapter includes description of scope of research, the target group and sample selection. Moreover, the data collection instrument (questionnaire) is also described in forms of its construction, validity and field-testing as well as the procedures and methods employed for data analysis.

The study was undertaken for investigating the importance of NWFPs at the study area in terms of its contribution to income generation and consumption and the impacts of these activities on the regeneration and sustainability of the resource. It worth mentioning that considerable numbers of people involved in gathering, hunting, processing, trading and other aspects of their production and use, most rural people use some forest products, and many obtain part of their income from forest products activities.

Two types of data were used to collect the necessary information, namely, primary and secondary data. The source of the secondary data includes FNC files, annual reports, project documents, and previous studies conducted in the same site. The primary data were principally collected through interviewing to investigate the local peoples perception towards their reliance on the NWFPs in the study area. More specifically, the data cover the main items of the objectives of the study mentioned in chapter1

4.2 Selection of Study Area

Several states in the country are characterized by high production of NWFPs at the national and international levels. The major NWFP produced in North Kordofan State is gum arabic, and the other NWFPs do not receive special considerations like gum arabic. Despite the meager resources of NWFPs in Um Rawaba Locality, still it contributes to income generation of some local people. Moreover, due to the acute poverty of the inhabitants of the state,

consumption of NWFPs is considered as a source for diet diversification and self satisfaction. This reliance has serious impact on the sustainability of the resource. Accordingly, Um Rawaba Locality was selected as a case study since the local markets trade on NWFPs.

4.3 Selection of Villages

Five villages were selected from El Rahad Administrative Unit. Villages were classified into three categories (large, medium and small villages) based on the number of households. The selection of villages in each category was based on random sampling. It worth mentioning that the small villages range between 24 – 597 households, the medium villages range between 598 – 1195 households, while the big villages consists of more than 1196 households. Table (4.) shows the selected villages.

Table (4.1): Selection of villages and households

	Range of households	Selected villages
Small villages	24 – 597	Abu Teleh Omer Eradieb a Elmahata
Medium villages	598 – 1195	shig El Windi Um Draba El Tahir
Big villages	1196 – 1816	Goz Bashara.

4.4 Selection of the Respondents

Being the nuclear base of the local community, the household is selected to be the basic unit of analysis for this study. The primary data was collected from the surveyed population using the questionnaire as a tool for face-to face interview. This technique was chosen though it is expensive, time consuming and needs an interviewer who is capable of asking the questions in a clear standardized and concise way, recording carefully the answers and maintaining a good rapport with the respondents, motivating and guiding them through the questionnaire (May, 1993). In spite of the above-mentioned constraints this tool seemed to be the most suitable one because: 1/ the majority of the respondents were expected to be illiterate. 2/ to avoid any problem with the sample frame. 3/ the interviewer will be able to record and

observe even the non-verbal gestures of the interviewee. A structured questionnaire was used for the household respondents where the questionnaire included questions covering the following key areas. Demographic questions about the respondents' tribe, age, and sex, level of education, occupation, income, marital status and number of children were developed and put at the beginning of the interview schedule. These questions are followed by questions about land ownership, the cultivated crops, and the sources of income, in addition to information about the type of the activities practiced by the respondents.

Data on the NWFPs was collected using questions developed to obtain information about, the NWFPs prevailing in the study area and their sources at the disposal of the local people, utilization systems of these products, methods used for collection, distances travelled to the sources of these products, frequency of collection and time spent in collection in addition to their marketing. No sampling percentage was determined for the selection of respondents at the assumption that the community is homogenous (of almost one tribe of similar traditions and environment), accordingly the available heads of household available during data collection were subjected to interviewing.

4.5. Other sources of primary data

Group discussion methods were used in this research with FNC personnel at the study area. Themes of discussion are almost similar to the questions formulated in the local people questionnaire. The aim of this method “group discussion” is to validate findings obtained from local questionnaire and enrichment of findings through elaboration of the FNC personnel on the different topics covered by the research. Appendix (1) shows the checklists which represent the core of discussion with FNC personnel.

4.6. Construction of the questionnaire

The construction of the questionnaire was made according to the guidance of FAO (1985). The suggestion of the supervision as well as ideas of other experts in the field of study helped to reach the final format of the questionnaire. The following guidelines of Burchinal (1986) were also given special consideration in the construction of the questionnaire:

- To be certain that each question was relevant to the topic and necessary.
- To express each question as simply as possible.
- State questions in specific concern to terms.
- To obtain criticism of all prepared items by a colleague or friend.
- To state the items in the language respondents use in every day conversation.

Two types of questions were used in the questionnaire, closed-end questions, with mostly multiple choices or yes and no style of answers, and dichotomous question in step-wise style, each answer leading to specific set of follow up question with no open-ended question except where it is inevitable. Appendix (2) shows the tool of data collection “Questionnaire of local people”

This type of questions was used in order to:

- Make the least demand upon respondents.
- Permit quick, efficient collection of data.
- Permit easy, quick and accurate analysis of the answers.
- The combination of question and associated response categories sometimes help respondents to understand the question more clearly.
- They are more useful in obtaining answers to sensitive questions.
- The open-ended question at the proper level of generality.
- Responses difficult to analyze and summarize.
- They may impose considerable burdens on respondents and interviewees.
- They are more likely to produce irrelevant and worthless data.

4.7. Organization of data

The conceptualization step was followed by the organization of the questions. The following guidelines were considered:

- To begin with simple, easy answer questions.
- To place sensitive or more complex questions late in the questionnaire.
- Where it makes sense, to place the items in logical order.
- To try to create an interesting mix of items within the questionnaire.

An introduction was set to the questionnaire at the top of the first page of the questionnaire. The introduction was written in short, simple sentences in the local language used by the respondents and in words they understand. The introduction was composed of the following elements.

- Identification of the person conducting the research.
- Explanation of the purpose of the study and why it is important.
- Explanation of how the respondents were selected.
- Assurance that answers would be protected and not made known to any one else to assure confidentiality.

4.8. Pre-testing

The formulation of the questionnaire was followed by a pre-test step to discover and correct any flaws in it. The purpose of the pre-test is to make sure that the questionnaire would deliver reliable and valid data for answering the problem under investigation. The final year students of the faculty of forestry, University of Khartoum, as part of their study course, were asked to critique the questionnaire, and to estimate how the respondents will be able to respond to the questionnaire. According to the comments of students, the draft questionnaire was revised. Finally, the supervisor checked the questionnaire, and accordingly, some questions were prepared in simple forms with minimum items to obtain necessary information. The questionnaires were finally revised and printed (Annex I).

4.9. Permission for data collection

Prior to the start of data collection, the General Manager of the FNC was informed about the nature of the research and the study area. A request letter was addressed to the General Manager of FNC to issue an order to the forest officers in the study area to offer the possible assistance and to help in data collection. After reaching any selected village, the first step involved was obtaining permission from local authorities before conducting the survey. This permission is certainly recommended of survey in rural areas where the residents may be more suspicious of outsiders. The permission was taken from the local authorities. The leaders were also asked to convince the local respondents to cooperate in conducting the research.

4.11. Statistical analysis

The statistical analysis was commenced through exploratory manipulations of the data obtained in the study area. This process was accomplished by critically examining the data through the use of simple tables and selected cross-tabulation which allows tentative answers to many of the question being asked in the survey.

CHAPTER FIVE

RESULTS AND DISCUSSION

5.1. General characteristics of respondents

5.1.1. Age classes and main tribes

It is true that the distribution of the population in the country most likely takes the form of dominance of certain tribes in certain geographical locations. For example Nuba Mountains are inhabited by Nubian tribes and the same is true for the tribes in northern Sudan. The study area is not an exception where the majority of the respondents belong to Gawama tribe. About 77.9% of the respondents asserted that they belong to this tribe, while 7.6% belongs to either Bidiria or Selihab tribes. The rest of the percentage represents the rests of the tribes which exists in the study area in small proportions. According to the anthropological studies of the countries the recognition of the tribes can be an indication to the type of the economical activity adopted by the tribe for income generation as the case for the livestock herders (Kababish and Bagarra) or farmers (settled or shifting cultivation) or gum gardens. Table (5.1) shows the different tribes in the study area and the age classes of the interviewed sample.

Table (5.1): Main tribes and age classes in the study area

Village	N*	Tribe		Age classes (%)			
		Gawama (%)	Bidiria & Selihab (%)	16>	17-32	33-49	>49
Abu Teleh	10	90	0	10	20	30	40
Aradiba El Mahta	12	58.3	16.7	8.3	25	8.3	58.3
Shig El Windi	16	87.5	0	0	28.6	28.6	42.9
Um Draba Eltahir	22	77.3	18.2	0	40.9	27.3	31
Goz Beshara	42	77.3	9.1	2.4	28.6	38.6	31.8
Total	104	77.9	7.6	3	30	30	37

* No. of respondent

In the data collection consideration was made to include all the age groups in the study (children (less than 16 years, young youth (17-32 years), mature (33-49 years) and old (more than 49 years)). The children represent 3% of the interviewed sample while the young and mature youth were represented by 30% for each. The old people represent 37% of the interviewed sample. All the age groups were considered in this study to reflect the degree of involvement in NTFP collection and marketing.

5.1.2. Educational level and gender

The bulk of the respondents are males (78.8%) and females represent the rest of the respondents (21.2%). This can be verified by the fact that men usually shoulder the responsibility of marketing of NWFP and their collection from remote areas. About 73.1% of the interviewed sample is married. Table (5.2) shows the gender, marital status and level of education in the study area. This could be due to the simplicity of wedding ceremonies and perception of the local people to early marriage as a social investment where women contribute to the welfare of the families through their contribution to income generation besides their additional responsibilities as females. In the study area women participate actively in all the agricultural operations in the study area.

Table (5.2): Educational level and marital status in the study area

Village	Males (%)	Married (%)	Educational level		
			Illiterate (%)	Khalwa (%)	Primary (%)
Abu Teleh	70	60	30.0	30.0	40.0
Aradiba El Mahta	66.7	75	58.3	8.3	33.3
Shig El Windi	75	68.8	68.6	6.3	25.6
Um Draba Eltahir	81.8	81.8	72.7	0.	27.3
Goz Beshara	84.1	72.7	50.	25.	25.0
Total	78.8	73.1	56.7	15.4	27.9

The above-mentioned table shows the education level in the study area. None of the respondents had the chance to pursue his education beyond the primary level. The majority of the respondents are illiterate (56.7%) while 15.4% had khalwa education. Accordingly the bulk of the respondents (72.1%) either

illiterate or had Khalwa education level. The rest of the respondents (27.9%) had primary education. These findings clearly reflect the ignorance of education due to either lack or limited schools in the study area. For those who have the chance to follow their education have to travel to neighbouring villages and reside with their relatives or family friends.

5.1.3 Sources of income and family size

In the rural areas families rely on their members for income generation which is mainly agriculture as employer from one hand and from another hand for social prestige. Therefore, it is common to find big families in the rural areas. This fact is supported by the findings of Table (5.3) which shows that 54.2% of respondents asserted that families consist of more than 9 members, while 31.1% stated that their families consist of 5-8 members. The rest of the respondents (14.6%) accentuate that the members of their families fall within the range of 2-4 members. As far as NWFPs is concerned, the bigger the family the greater amount of NWFPs is collected. Bearing in mind that NWFPs is collected accidentally after or during the farming or animal rearing activities.

Table (5.3): Sources of income and family sizes in the study area

Village	Family members			Source of income			
	2-4 (%)	5-8 (%)	>9 (%)	Agric & NWFP (%)	NWFP (%)	Animal & NWFP (%)	Handicraft (%)
Abu Teleh	0.0	50.0	50.0	40.0	20.0	40.	50.
Aradiba El Mahta	10.0	30.0	60.0	83.3	16.7	0.0	27.3
Shig El Windi	13.3	40.0	46.7	37.6	0.0	62.5	31.3
Um Draba Eltahir	23.8	38.1	38.1	81.8	4.5	13.6	59.1
Goz Beshara	15.0	20.0	65.0	91	0.	9.1	47.7
Total	14.6	31.1	54.2	75	4.8	20.1	45.6

Seventy-five per cent of the interviewed sample asserted that they rely on agriculture as the main source of income besides collection of NWFP. This finding is applied on all the villages selected for this study except Abu Teleh and Shig El Windi where agricultural activity is not the main source of

income. In the former handicraft is the dominant activity while in the latter animal rearing is the dominant activity. Handicraft activity is the second important activity for income generation after agriculture as asserted by 45.6% of the respondents. It worth mentioning that most of the handicraft activities rely on NWFP. Animal rearing and NWFP was mentioned by 20.1% of the respondents as a source of income generation. Only 4.8% of the respondents rely on NWFP purely for income generation because either they are brokers or traders in NWFP. From the above finding it is apparent that by a way or another local people are indulged in the activities of income generation relying on NWFP.

5.2 NWFPs production in the study area

According to the secondary data collected from the FNC, production of NWFP is not stable across the period 1997 – 2008 (Table 5.4). It worth mentioning that this data is collected from the FNC royalties for the above mentioned period. The first observation drawn from this table is the fact that the amount of collected NWFP is relatively small compared with other states of the country. The highest production is recorded for Aradaib (4749 Kg) although its collection is sporadic across the above-mentioned period of time. Aradaib is followed by Garad (4081.5 kg) which is collected from *Acacia nilotica* (var. *temontosa*) which grows along the seasonal water courses and natural water depressions in the study area. Despite the high production of Garad, years 1998, 2003, 2005, 2006 and 2008 have not appeared in the records of the FNC for the production of Garad. The second observation is the fact that the production of NWFPs across the period 1997 – 2008 showed a fluctuating pattern. Heglig, Tabaldi, Sinamaka and Dom did not appear in the records of the FNC for the years 1997 and 1998, while some other NWFPs appeared in the records in some years while disappear in others. Although Heglig and Sidir showed lower collected amounts, they appeared more in the records of the FNC compared to the other NWFPs. Table (5.4) shows the production trends according to the records of the FNC.

Table (5.4): NWFPs production for the period 1997 – 2008 in the study area In KG

Year	Laloab	Gonglize	Aradaib	Nabag	Sinamka	Garad	Saaf *	Other
1997	-	-	4290	223	-	22	-	-
1998	-	-	-	-	-	-	30	-
1999	15	330	-	155	165	30	-	-
2000	-	13	164	-	-	306	-	-
2001	140	140	235	400	-	130.5	104	-
2002	56	20	13	204	4	28	194	-
2003	8	-	-	10	-	-	160	-
2004	19	-	-	10	-	3525	241	-
2005	10	334	-	60	-	-	-	-
2006	303	-	25	-	-	-	135	-
2007	1240	190	22	75	-	40	271	-
2008	514	111	-	20	23	-	49.5	6
Total	2305	967	4749	1157	192	4081.5	1184.5	

Source FNC (* Saaf /tarad)

The findings of the above table clearly showed that either the productivity of NWFPs is very small in the study area or most of these products do not pass through the royalties offices. Regarding the production of NWFPs, Fig. (5.1) shows the total amount of NWFPs collected from the study area during the period 1997 – 2008.

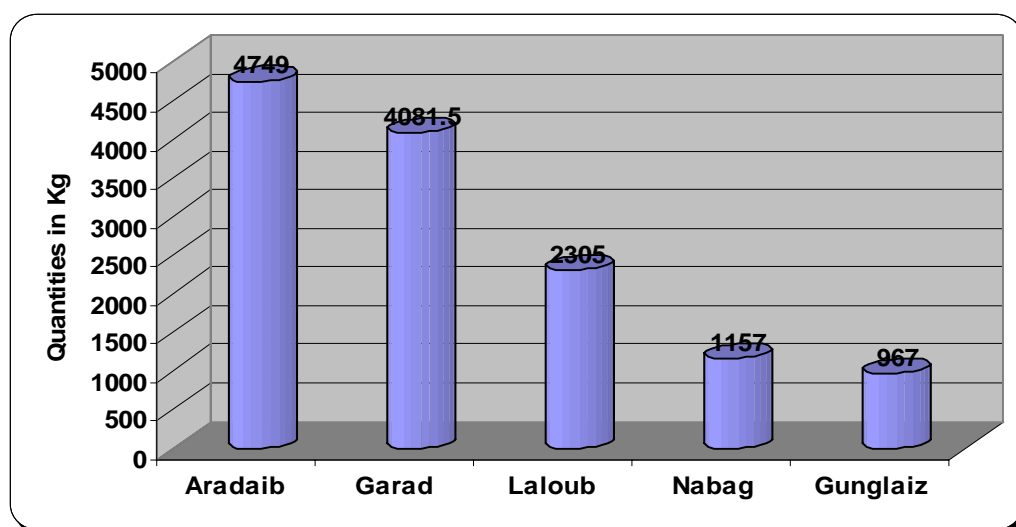


Fig. (5.1): Quantities of NWFPs collected from the study area

The above findings agrees with Al Abass (2006) showing that, in general, in addition to fuel wood thirty-four NWFPs were collected and used consumed or marketed by households in the study area although variations occur among different households as social factors vary. The most important of these products, depending on the count of collectors, are the products of the following species: *Zizyphus spina-christi*, *Balanities aegyptiaca*, *Adansonia digitata*, *Acacia nilotica*, *Tamarindus indica*, *Cassia senna* and *Grewia tanex* (Nabag, Laloub, Gunlaize, Garad, Aradie, Sannamaka and Godiem, respectively).

5.3 Main trees for NWFPs production and places of collection

The respondents showed two sources for the collection of NWFP in the study area, namely natural forests around the villages and farms. All the respondents of the different villages except Shig El Windi rely on their farms for the provision of NWFP, while the rest of the respondents showed that they collect NWFP from natural forests in the study area. Table (5.5) shows the places of NWFP collection and the main trees from which NWFPs are collected. It seems that the local people in the study area used to retain some trees at their homesteads for the sake of provision of shade and shelter beside collection of NWFP. The main trees retain at farms are sidr, higlig and godim as stated by the majority of the respondents (72.8%). As mentioned earlier collectin of NWFP take place accidented where the farmer after finishing his work is used to collect some NWFP before returning home either for consumption by the family or to be marketed at familiar disposal points known by the farmer. Some respondents (11.3%) asserted that they only collect Higlig fruit (laloub) because it is the only tree at their farms and due to the high demand at the market with relatively suitable prices. Sidir fruit (nabag) was mentioned by 7.7% of the respondents as the NWFP they used to collect from the farms or from the surrounding forests. Some respondents (4.9%) stated that they collect nabag, godeim, gonglize and laloub fruits from their farms. From the above findings it is clear that the respondents tend to

retain more than one type of trees at farms for sake of diversifying the products to guarantee marketing of most if not all of their products.

Table (5.5): Places of NWFP collection and the main trees producing for provision of NWFPs

Villages	Place of collection		Main tree types for NWFP			
	Farm (%)	Around village (%)	Higlig (%)	Sidr (%)	Sidir, Higlig & goddeim (%)	Sidir Godeim, Tabaldi & Higleg (%)
Abu Teleh	100	0.0	15	15	50.0	20.2
Aradiba El Mahta	100	0.0	27.3	18.2	27.3	0.0
Shig El Windi	93.8	6.3	16	15.3	62.5	6.3
Um Draba Eltahir	100	0.0	13.6	0	86.4	0.0
Goz Beshara	100	0.0	4.5	4.5	86.4	4.5
total	99.0	1.0	11.3	7.7	72.8	4.9

5.4 Collectors of NWFP and purposes of collection

It seems that all the family members are indulged with NWFP directly or indirectly, but still women remain the main collectors of the NWFP as asserted by 73.1% of the respondents indicating that NWFP is women profession in the study area. In many places, women are responsible for the household activities that involve forest-based foods and medicines, as well as fuel wood. In this respect NWFPs are particularly important to women, addressing their needs for food security and nutrition (FAO, 1995). While it is sometimes assumed that women are mainly involved in subsistence activities, in fact they are extensively involved in many forest-based gathering and processing enterprises. Women often have little access to land and capital resources. Thus, forests provide a source of raw materials and products for cash sale. In addition, women often combine cash earning activities with forest based subsistence activities such as food and medicine collection. Many forest-based activities can be undertaken near the homestead, thus allowing women to combine these activities with domestic chores (Arnold, 1995). It is estimated that women constitute 51% of the total workforce involved in forest-based small scale enterprises in India, amounting to over 518 million rubies annually. Ninety percent of the forest- based employment

for women is generated in forest- based small scale enterprises. This is in direct contrast to their involvement in purely wood-based large scale forest industries, in which women constitute around 10% of the workforce (FAO, 1991).

Males also participate in the collection of NWFP as mentioned by 16.3% of the respondents particularly if collection has to be made from areas remote from the villages, while 10.6% of the respondents mentioned that children also participate in the collection of the NWFP in the study area. Table (5.6) shows the main collectors of NWFP in the study area and the purpose of collection.

Table (5.6): Collectors of NWFP and purposes of collection

Villages	Purpose of collection		Collection of NWFP		
	Consumption (%)	Trading & consumption (%)	Men (%)	Women (%)	Children (%)
Abu Teleh	40.0	60.0	20.0	50.0	30
Aradiba El Mahta	45.5	54.5	25.0	58.3	16.7
Shig El Windi	40.0	60.0	31.3	56.3	12.5
Um Draba Eltahir	14.3	85.7	13.6	86.4	0
Goz Beshara	18.2	81.8	9.1	81.8	9
total	25.7	74.3	16.3	73.1	10.6

NWFPs are collected in the study area for different purposes. The majority of respondents (74.3%) stated that they used to collect NWFP for marketing (income generation) and for consumption. Sometimes NWFP represents the only nutritional diet during the hot summer days which coincide with land preparation for agricultural activities. The rest of the respondents (25.7%) stated that they used to collect NWFP and consume it as snacks at the farm or during chatting at the house yard.

Although the quantities of forest foods involved may be small, their nutritional contribution is often critical, especially at certain times of the year, and during droughts or other emergency periods when cultivated foods are unavailable. Some forest foods, are consumed throughout the year by rural households, but the most wide spread use of forest foods is in meeting

seasonal food shortages either as nutrition gaps or hunger periods. These usually occur at the end of the dry season, they are also valued during peak periods of agricultural work, when less time is available for cooking (FAO, 1989). Forests and woodland areas, especially in Africa, have traditionally played a vital role during emergency periods, such as in drought, famine and war times (FAO, 1989; 1991).

Although the majority of the respondents collect NWFPs either for trading or consumption, it seems that collection of these products is mainly for household's consumption. This fact is supported by the findings of Table (5.7) which indicates the low amount of money collected by the FNC as royalties for trading in NWFP. The highest fees collected from the NWFPs by the FNC is obtained from heglig (5421.6 SD). This clearly indicates the high stocking density of this tree in the study area. The laloub is followed by Aradaib, Dom and gonglaiz with collected fees 2863.1, 2852.6 and 2292.5 SD, respectively. Garad and Nabag showed a moderate level while sinamaka and some other NWFPs showed a lower level.

From the finding it is clear that the NWFPs is not gaining momentum among the administration of the FNC where no attempts are made to enhance trading of NWFPs and encourage the afforestation programs of trees producing these products. This agrees with FAO (1995) showing that modern science and governments for so long overlooked the importance of this non-wood forest wealth. This fact is supported by Chandrasekhar (2004) showing that most of NWFPs are used mainly for rural subsistence or local markets. They often go unrecorded in official statistics, which focus on nationally traded goods. Moreover, modern forestry has favored timber and large scale enterprises, and has generally regarded non-wood forest products as incidental.

Table (5.7):– Royalty paid for some NWFPs (1997-2008, SDG) .

Year	Laloub	Gonglize	Aradaib	Nabg	Sinamka	Garad	Saaf	Other
1997	-	-	1268.6	187	-	11.250	-	
1998	-	-	-	-	-	-	42	
1999	60	841	-	135	231	42	-	
2000	-	54	685	-	-	420	-	
2001	379.1	889	525	312	-	358	87	
2002	159	42.5	65	294.3	7	61	236	
2003	27	-	-	35	-	-	112	
2004	35.5	-	-	10	-	190.95	1427.4	
2005	93	233	-	228	-	-	-	
2006	152	-	141.5	-	-	-	144	
2007	2685	152	178	136	-	42	297.2	
2008	1831	81	-	100	69	-	507	30
Total	5421.6	2292.5	2863.1	1437.3	307	1125.2	2852.6	30

5.5 Distance traveled for NWFP collection

It seems that the NWFP were collected in the natural forests in the study area, and the collection of NWFP is confined to trees growing on farms as mentioned by 35.6 percent of the interviewed sample, while 20.1% of the respondents asserted that they used to collect NWFP, particularly those do not exist at their farms, within a distance of 1 – 2.5 km. Members of this group stated that they collect these products for household consumption. Some respondents (37.5%) stated that they collect the NWFPs from a distance of 2.6 – 3.5Km, and the rest of respondents (49%) asserted that they collect the NWFPs from distances more than 3.5Km. The last two groups seem to collect the NWFPs for trading, therefore they find themselves obliged to cross devastating distances in search for the NWFPs. Fig. (5.2) shows the distance traveled by the respondents for the sake of collecting NWFPs in the study area.

From the above findings it is clear that some respondents used to retain some NWFPs producing trees at their farms for the sake of collecting the NWFPs and some of them used to collect these products from the natural forests. The long distance covered for the NWFPs indicates the scarcity of the NWFPs producing trees in the study area

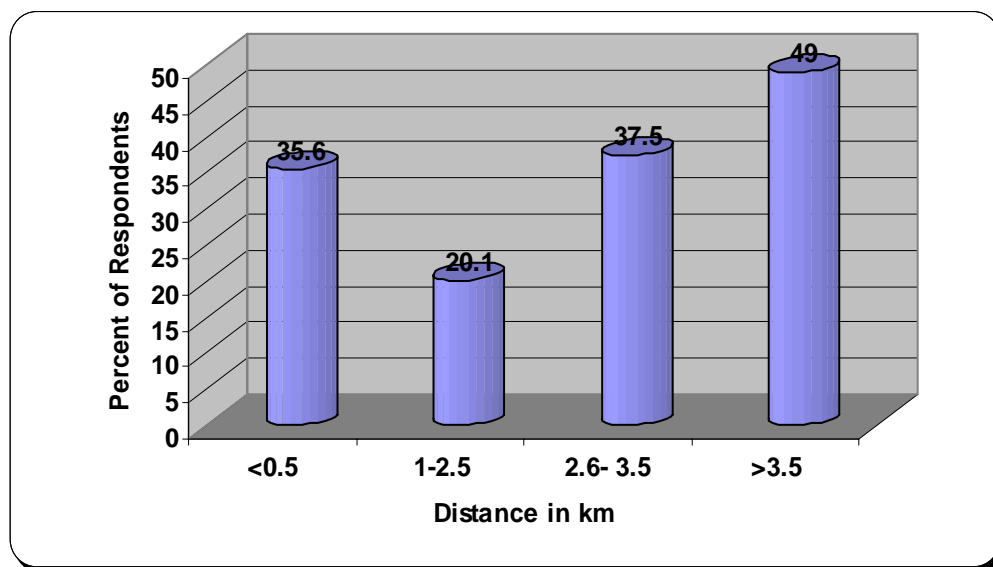


Fig (5. 2): Distance traveled for NWFPs collection

5.6 Suitable time for collection of the NWFPs

There is a great variation in the times of collection of NWFP as asserted by the respondents. Table (5. 8) shows the time preference of the collector of NWFP. About 26.9% mentioned the afternoon as a suitable time for collection of NWFP where the temperature become moderate and the farmers accomplish all their tasks whether it is agricultural activity or another job, while 10.6% of the respondents stated that it depends on the leisure time of the collector where all the day long is suitable for collection of NWFPs.

Collection of NWFP at morning is preferred by a high percentage of the respondents (41.3%). This finding could be verified by the fact that inhabitants tend to collect some of the NWFP before starting their main activities, while 16.3% asserted that they collect NWFP both at morning and at afternoon. Some respondents (4.8%) mentioned evening as a suitable time for collection of NWFPs.

According to their allegations, at this time winds shake the branches and drop the ripe fruits on the ground. If they have not collected the dropped fruits at

evening they will be collected by others on the early morning of the next day. Therefore, sometimes collectors use torches for the collection of NWFP

Table (5.8): suitable time for the collection of NWFPs in the study area

Villages	Morning (%)	Afternoon (%)	Morning & Afternoon (%)	Evening (%)	All day (%)
Abu Teleh	0.00	40	10	20	30
Aradiba El Mahta	0.0	50	0.00	0.00	50
Shig El Windi	25	68.8	0.00	0.00	6.3
Um Draba Eltahir	63.6	4.5	22.7	4.5	4.5
Goz Beshara	56.8	13.6	25	4.5	0.00
total	41.3	26.9	16.3	4.8	10.6

5.7 Time calendar for the collection of NWFPs in the study area

The respondents were asked to show the time calendar of NWFP collection in the study area. The dominant NWFP list included fruits of Sidir, Goddeim, Tabaldi, and Higlieg beside a long list of other NWFP which were mentioned in low frequencies. Fig (5.3) shows the time calendar of some NWFP in the study area. From the above-mentioned figure, it is apparent that the collection of NWFP last for five months (September to January). Moreover, the time calendar of collection of NWFP differs from one product to another. The period of September to January is the period of collection of Tabaldi and Goddim fruits as asserted by all the respondents and 75%, respectively. Collection of Higlieg and Sidir fruits during this period is relatively low compared to the other products as mentioned by 24.7% and 24.5% of the respondents, respectively. The period between October - December, Tabaldi fruits are also collected as asserted by 71.4% of the respondent. Similarly, Heglig and Sidir fruits are also collected during this period as mentioned by 49.5% and 48%, respectively.

At this period, collection of Goddeim was only mentioned by 16.7% of the respondents, while the period of November to December the amount of NWFP collection declined sharply for most of the products. During this period 29.6% of the respondents asserted that they collected Tabaldi fruits,

while 27.6% mentioned they collect Sidir fruits and 25.8% mentioned laloup collection. Ten per cent of the interviewed sample asserted that they collect Goddeim during this period.

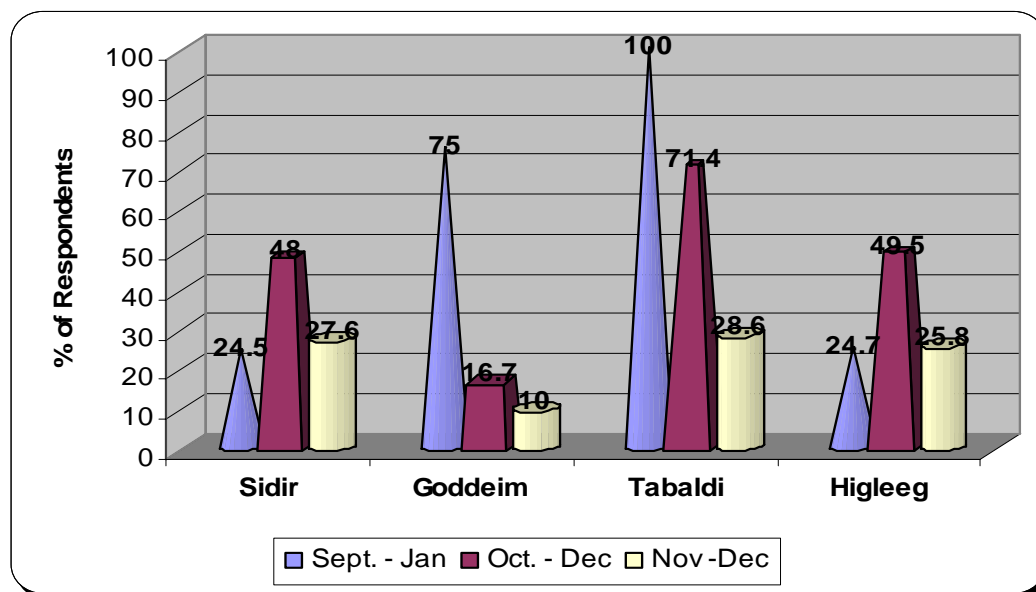


Fig. (5.3): Time calendar for the collection of some NWFPs

Comparing the time calendar of NWFPs as indicated by the respondent and the months that witness report of NWFPs by the FNC indicates that there is a continuous flows of NWFPs although the collection of the products is not taking place all the year around. Fig. (5.4) shows the amount of NWFPs according to the records of the FNC.

It is clear from the above figure that there is a fluctuating trend in the number of months that witnessed reporting of NWFPs quantities in the records of FNC. Years 1998, 2000, 2003, and 2005 showed the lower number of months for NWFPs collection, particularly for year 1998 where there is no record for any type of NWFPs, while in year 2003 only one month witnessed collection of NWFPs from the study area. This finding is attributed to the fact that these years were proceeded by years of a relatively lower amount of rainfalls. Therefore, the productivity of NWFPs was relatively low compared to other years and the amount collected NWFPs were not of a merchantable size.

However, years 2001, 2002, 2004, 2006, 2007 and 2008 showed the highest number of months for NWFPs collection (8 or more months).

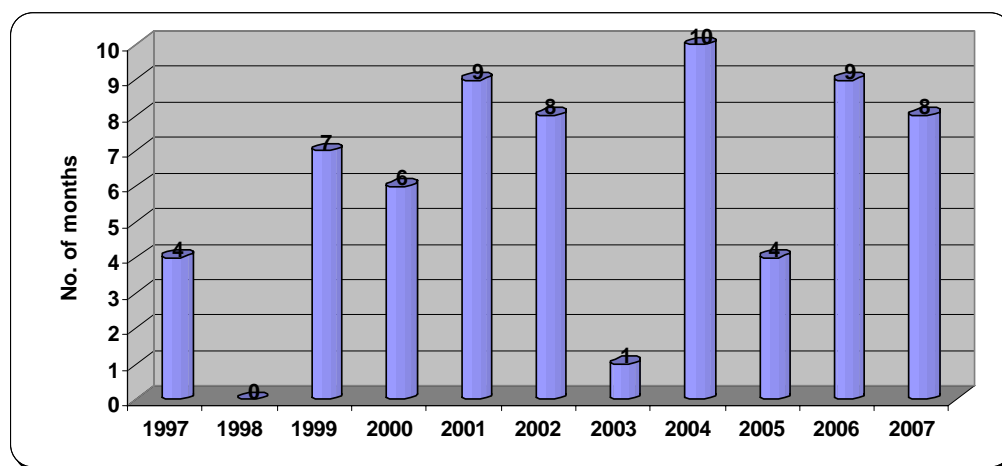


Fig. (5. 4): Monthos of NWFPs collection (FNC 1997-2008)

5.8 Methods of NWFP collection at the study area

The respondents in the study area showed different methods for NWFP collection (Table 5.9). Almost half of the respondents (50.5%) stated that they collect the NWFP directly from beneath the trees (from the ground). Those respondents asserted that reliance on this method for NWFP collection necessitate collection in early morning before being eaten by animals. About 45.6% of the respondents stated that they used to collect NWFP through hand picking. The respondents verified their reliance on the method due to the high competition among villagers for collection of NWFP. Some NWFP may be collected before ripening, particularly Tabaldi fruits. Moreover, some respondents asserted that they tend to collect the fruits before ripening to avoid their damage by birds. Some respondents (2.9%) accentuate their reliance on sticks for collection of NWFPs, while 1% stated that they used to stretch local mats made from the leaves of dom trees.

Table (5. 9): Methods of NWFP collection in the study area

Villages	Method of NWFP collection				Indigenous knowledge of collection	
	Stick (%)	Mats (%)	Hand picking (%)	From ground (%)	Heritable (%)	Training (%)
Abu Teleh	10	10	50	30	100	0.00
Aradiba El Mahta	16.7	0.00	50	33.3	83.3	16.3
Shig El Windi	0.00	0.00	68.8	31.3	100	0.00
Um Draba Eltahir	0.00	0.00	42.9	57.1	95.5	4.5
Goz Beshara	0.00	0.00	36.4	63.6	93.2	6.8
total	2.9	1	45.6	50.5	94.2	5.8

The majority of the respondents (94.2%) stated that the profession of NWFP collection was gained through inheritance, where they grow and found their relatives indulged with the activity of NWFP collection and they proceeded on the same line, while 5.8% stated that their relatives were not indulged with NWFP collection but they gained this profession through observation and training. The entire interviewed sample accentuated that there is no any processing made for the collected NWFP. The above mentioned methods of fruits collection agrees with Al Abbas (2006) stating that the common collection system practiced in the study area under rights bestowed was for utilization at home level and sale in the local markets. The study also showed that a number of socioeconomic factors are related to collection and marketing, in particular, gender is an important factor. NWFPs are common property in the communal land, while they are private in family land. The fruit was the main part used in addition to the leaves, seeds, branches, flowers, stems, and roots. The main uses were confined mainly in food, drink, fuel and medicine. Forage, cosmetic and some home industries were also mentioned as uses.

5.9 Marketing of NWFP at the study area

NWFPs has provided income to rural people in Sudan since ancient times, yet, limited research has been done to identify the products, and far less is known about their role, management and marketing. Although there is an

increasing recognition of the importance and wide use of NWFPs, still there is a lack of information about these products, areas of production, quantities, values, marketing, uses and producers (Suleiman and Eldoma, 1994). Local people in the study area have limited channels for the disposal of their collected NWFP. Table (5.10) shows the different channels for marketing NWFP. The majority of the respondents (60.2%) stated that they used to transport their collected NWFP to El Rahad market and very few respondents mentioned EL Simaih market. It seems the preference of markets of the principal cities in the study area is linked with the closeness of the principal cities. The prices at El Rahad market is the driving factor for marketing NWFP at EL Rahad compared to EL Simaih market. About 26.2% of the respondents stated that they prefer to dispose their collected NWFP at the village level to the brokers or the village merchants to escape the cost of transportation of the products to the principal cities markets in the study area, while 13.6% stated that they dispose their product at the near villages where they receive reasonable prices compared to by the prices provided by the brokers.

Table (5.10): Marketing of NWFP in the study area

Villages	Markets of NWFP			Marketing of NWFP	
	Village (%)	Nearby village (%)	El Rahad market (%)	Men (%)	Women (%)
Abu Teleh	20	30	50	30	70
Aradiba El Mahta	58.3	8.3	33.3	25	75
Shig El Windi	25	12.5	62.5	18.8	81.3
Um Draba Eltahir	14.3	4.8	81.	0.00	100
Goz Beshara	25	15.9	59.1	4.5	95.5
total	26.2	13.6	60.2	10.7	89.3

It seems that marketing of NWFP is women task in the study area where the majority of the respondents (89.3%) stated that women usually take the responsibility of marketing of forest products. Some respondents (10.7%) stated that men also take the responsibility of marketing of forest products particularly if marketing of NWFP necessitate travel to markets of principal

cites in the study area. From the above finding it is apparent that NWFPs contribute to the sustainable livelihood of local communities. This agrees with CFAN (1992) showing that NWFPs are an integral part of the livelihood of the 500 million people who live in or near tropical forests that cover 20 percent of the world's land mass. Moreover, Shepherd (1998) emphasized that rural development is clearly about improving the life chances and well being of individuals and households, particularly the mass of rural poor who have been left behind in the process of economic growth. Rural incomes are very low in most poor countries so, as indicated by kleinn et.al (1996) the promotion of NWFPs can and should complement the objectives of rural development and appropriate forest management, as they are sources of alternative employment and income generation.

5.10 Transportation and harmful agents to NWFPs.

As mentioned earlier, NWFPs are collected either for consumption by household members or for trading. The method of transportation depends on the quantity collected from the product. Table (5.11) shows the different methods of transportation of NWFP and their relative cost. For small collected quantities of NWFP transportation is usually through hand or head load as asserted by 41.6% of the respondents in the study area. For those who rely on the NWFP for trading (income generation) different methods are used because the collection of the NWFP may necessitate crossing of devastating areas. Accordingly the financial wellbeing of the collector determines the method of NWFP collection. For small traders donkeys and animal carts are the suitable means for transportation of NWFP as indicated by 26.7% of the respondents. When the target is to collect the maximum possible amount of NWFP, trucks are rented to cover a wide area.

About 69.5% of the respondents stated that the cost of one travel for collection of NWFP varies between 1 – 6 SDG, while 25.5% stated that it varies between 7 – 15SDG for one travel.

Table (5. 11): Transportation and cost of transportation of NWFP at the study area

villages	Transportation of NWFP			Transportation cost (SDG)		
	Donkey (%)	Lorry (%)	Hand & head load (%)	1-6 (%)	7-15 (%)	>15 (%)
Abu Teleh	40	40	20	100	0.00	0.00
Aradiba El Mahta	36.4	27.3	36.4	83.4	0.00	16.7
Shig El Windi	13.3	6.7	80	50	25	25
Um Draba Eltahir	9.5	57.1	33.3	35.6	57.1	7.1
Goz Beshara	34.1	27.3	38.6	77.7	22.2	0.00
total	26.7	31.7	41.6	69.5	25.5	5.1

The rest of the respondents (5.1%) asserted that their cost of one travel of collected NWFP is more than 15SDG. The latter group is probably the trader groups who cover long distances and hire trucks or animal cart for the collection. It is worth mentioning that all the respondents asserted that no fees are paid and that to neither the FNC nor the traditional leaders receive any fees from the collection and transportation of NWFP.

5.11 Harmful agents and causes of damage to NWFPs

In the study area the respondents were able to pinpoint some factors which are hazardous to NWFP collection and their marketing. Table (5.12) shows the harmful agents that cause damage to NWFP and to the mother trees. The majority of the respondents (54.4%) stated that birds are the main menaces that endanger investment in NWFP. The study area is rich with different types of birds which feed on the NWFP and agricultural crops as well. The Department of Crop Protection of the Ministry of Agriculture, Irrigation and Animal Wealth of the state attempts to combat the swarms of birds which roam in big flocks in the study area. Marketability of NWFP product accordingly is influenced by the quality of the NWFPs. Of course bored fruits have less value compared to undamaged fruits by birds. Moreover, 22.3% of the respondents asserted that insects have similar impact on NWFP to that of birds. Sometimes the fruit is attacked by insects even before the ripening of

the fruit. The seed borer insect is the most dangerous agent that destroy the fruits. Similarly, leaves feeders have impact on the quality of NWFPs.

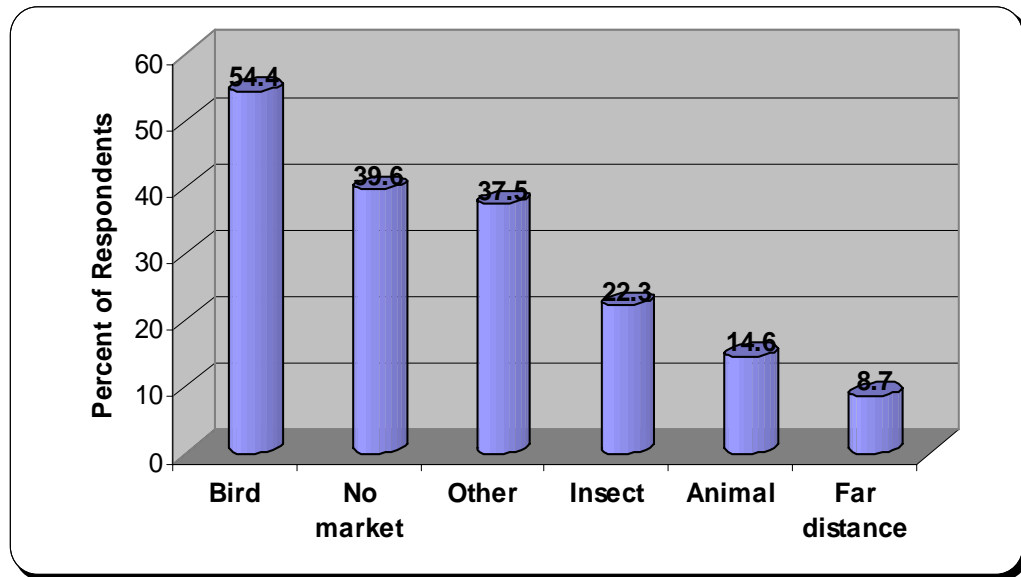


Fig. (5.5): Factors influencing NWFP collection and marketing in the study area

Due to the availability of NWFP under free access, markets at the village level or nearby villages are rare. Sometimes collectors could not dispose their NWFP due to lack of fund at the village level from one hand, and from another hand the inhabitant in the study area could collect what they need from the nearby forests or from their farms. This fact is supported by 39.6% of the respondents. This agrees with Al Abbas (2006) showing that the main constraints facing the marketing of the NWFPs in Sheikan Locality (North Kordofan State) are the low prices of the products and lack of the transportation means. While 8.7% of the respondents accentuated that collection from remote areas is a detrimental factor for the collection of NWFP where a truck or animal cart have to be available and affordable. Animals as a source of damage to NWFP were mentioned by 14.6% of the respondents. This is apparent when the animals are the first who reach the dropped NWFPs where they nib, chew and trample NWFP, particularly fruits

lying on the ground. Some respondents (37.5%) mentioned other factors that have impact on collection and marketing of NWFP in the study area.

5.12 FNC perception towards utilization of NWFPs

All the FNC personnel stated that although farming is the major activity in study area, NWFPs provide one of the potential alternative occupations during the slack period. The common collection system for the NWFPs in the study area practiced by the local households under rights bestowed was for utilization at home level and sale in the local markets. The local people perceive NWFPs in different ways. The majority of the local people rely on these products as food, while considerable proportions rely on these products for folk medicine. Few local people rely on NWFPs for income generation. The most common NWFPs is collected from *Zizyphus spina-christi*, *Balanites aegyptiaca*, *Adansonia digitata*, *Acacia nilotica*, *Tamarindu indica*, *senna senna* and *Grewia tanex*. Fruits of these trees are found to be of the most significant importance as they heavily gathered and used by the different communities at the study area. This was indicated by the large number of families documented to be involved in the collection of these specific species.

Regarding the distribution of these products in the study area and their accessibility for the people, the fruits of some trees are distributed all over the surroundings of the villages, inside the villages and within the agricultural lands. Some of them were also found in forests (natural, planted, reserved or unreserved, governmental or community forests). However, it could be said that these sites supply the inhabitants in the study area by different amounts of different available NWFPs. Collection of NWFPs from the common land (*ghifarland*) is a common property to all inhabitants of the study area, where every one in the community has free access to the trees in these lands throughout the year. Whereas for the family land, the NWFPs, the trees and their products are deemed to be a family property, this means that the family has the right to collect these tree products and control other peoples' access to

that specific land. This clearly reflects the land tenure system prevailing in the study area where the usufructuary rights were enjoyed by all community members for crop farming on *ghifar* (communal land) under *sheik's* (village leaders) jurisdiction. Usufructuary right of use of trees was lineage based. All tree products were accessible to the lineage members to use for both home consumption and market regardless of on whose land trees were growing.

Different techniques are used in the collection of NWFPs in the study area. It is evident that there was a considerable variation in the ways by which these products were harvested, at the same time there were no advanced harvesting techniques as such for the various NWFPs in the study area, simple techniques and tools that involved no external inputs were used. The main collectors of the fruits of some trees are women, the children were also found to participate considerably in this activity, whereas men were rarely involved in it. At the same time women also used to sell, the products which they extracted by themselves and have the revenue from it. The utilization of the NWFPs prevailing in the study area varies with the variation of the parts of the products, which were usually used by the households in these regions. For the majority of the NWFPs understudy the fruit was the main part that most of the respondents used.

Almost the entire inhabitants of the study area rely on the fruits of some forest trees for income generation particularly during times of summer where the sources of income become limited. Accordingly, these families get revenue or some income from selling these forest products which for many enter into their living expenses. A significant part of local trade on NWFPs in the study area took place through bartering as well.

The markets of the NWFPs in the study area are widely dispersed and of ephemeral nature. The bulk of trade in NWFPs is local - being sold between households and traders, inside the village or other rural markets, where households usually sell the products they gathered to retailers in the village,

trading intermediaries, in the village (in their own villages or neighbor villages), in nearby trade towns or to wholesalers in Elobied town. These retailers and intermediaries in turn take these products to trade towns in the nearby or to Elobied or sometimes to the capital. Some of the households used to collect the *garad* product said that sometimes they sell the product directly to a tannery found in the region.

CHAPTER SIX

CONCLUSION AND RECOMMENDATION

6.1. Conclusions

- The community at the study area is homogenous and members of Gawama tribe dominate other tribes (Bidiria and Selihab).
- The interviewed sample showed all the age groups (young, youth, mature and old) an indication of lack or low level of migration.
- The majority of the respondents (71.1%) is either illiterates or had preschool education (Khalwa).
- The family size is relatively big in the study area where 54.2% of respondents asserted that families consist of more than 9 members, while 31.1% stated that their families consist of 5-8 members.
- The majority of the respondents rely on agriculture as the main source of income besides collection of NWFPs. This indicates the importance of NWFPs in the resilience of local communities.
- The quantities of NWFPs collected from the study area according to the records of the FNC are fluctuating among the 1997 – 2008. Generally, the quantity collected is relatively low.
- The main NWFPs consumed at the household level or tradable are; Aradaib, Garad, Heglig, Tabaldi, Sinamaka and Dom. Quantities of these products are neither steady nor stable across the period of 1997 – 2008.
- NWFPs are collected from natural forests, around the villages and farms. The majority of the respondents collect the NWFPs from their farms.
- It seems that all the family members are indulged with NWFPs directly or indirectly, but still women remain the main collector of the NWFP as asserted by 73.1% of the respondents indicating that NWFP is women profession in the study area.

- NWFPs are collected in the study area for different purposes. The majority of respondents (74.3%) stated that they used to collect NWFP for marketing (income generation) and for consumption. Sometimes NWFPs represents the only nutritional diet during the hot summer days which coincide with land preparation for agricultural activities.
- Although the majority of the respondents collect NWFPs either for trading or consumption, it seems that collection of these products is mainly for household's consumption.
- The most tradable NWFPs are heglig followed by Aradaib, Saaf and Tabaldi. Garad and Nabag showed a moderate level while sinamaka and some other NWFPs showed a lower level.
- The bulk of NWFPs is collected from the farms, while 20.1% of the respondents asserted that they used to collect NWFP, particularly those do not existing at their farms, within a distance of 1 – 2.5 km and 37.5% collect the NWFPs from a distance of 2.6 – 3.5Km.
- Suitable time for collection of NWFPs varies according to the nature of the economical activities of the respondents about 26.9% mentioned the afternoon as the suitable time for collection of NWFP, while 10.6% of the respondents stated that it depends on the leisure time of the collector where all the day long is suitable for collection of NWFP. Collection of NWFP at morning is preferred by a high percentage of the respondents (41.3%).
- The collection of NWFP last for five months (September to January) in the study area. The time calendar of collection of NWFP differs from one product to another. The main products collected during this period are Tabaldi and Goddim fruits. Collection of Higlieg and Sidir fruits during this period is relatively low. The period between Octobers - December, showed high collection of Tabaldi, Heglig and Sidir fruits.
- Almost half of the respondents collect the NWFPs directly from beneath the trees (from the floor). Collection from the floor

necessitates collection in early morning before the fruits are eaten by animals. Other methods include hand picking, sticks and mats.

- Some respondents tend to collect the fruits before ripening, particularly Tabaldi fruits to avoid the damage of fruits by birds and insects. Moreover, some respondents collect fruits before ripening due to the competition among the collectors.
- Local people in the study area have limited channels for the disposal of their collected NWFPs. Some respondents (60.2%) transport their collected NWFPs to the principal cities in the study area (El Rahad and EL Simaih markets) due to possibility of attaining reasonable prices.
- Some respondents prefer to dispose their collected NWFPs at the village markets (to brokers or the village merchants) to escape the cost of transportation of the products to the principal cities.
- It seems that marketing of NWFPs is women task in the study area where the majority of the respondents (89.3%) stated that women usually take the responsibility of marketing of forest products.
- For small collected quantities of NWFP, transportation is usually through hand or head load as asserted by 41.6% of the respondents. While traders use different methods like animal carts, donkeys and trucks.
- Birds and insects are the main menaces that endanger investment in NWFPs. The study area is rich with different types of birds which feed on the NWFP and agricultural crops as well. Marketability of NWFPs is influenced by the quality of the NWFPs.
- The local people perceive NWFPs in different ways. The majority of the local people rely on these products as food, while a considerable proportion relies on these products for folk medicine. Few local people rely on NWFPs for income generation.
- All the FNC personnel asserted that there is no effort exerted by the FNC for inventorying NWFPs producing trees and the efforts of the

FNC (inventory department) aims towards inventory the stocking density and identification of trees.

- No attempts were made by the FNC for assessing the regeneration of NWFPs producing trees at natural and reserved forests. the FNC technical staff accentuated that no any study was made to investigate the seed bank at the study area moreover, at the nurseries, most of trees producing edible fruits are not raised in high quantities.

6.2. Recommendations

- The FNC should attempt to give special consideration for the NWFPs producing trees in terms of their regeneration, protection and inventory
- Extension services provided by the FNC should guarantee the sustainability of the resource for the coming generations.
- An extension campaign should be launched to encourage the local people to adopt trees at their farms and increase their stocking density.
- Organization of local communities into associations would enhance trading in the NWFPs; therefore raise the standard of living of local communities.

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APPENDIXES

Appendix (1)

Checklist of FNC Personnel

1. What is the main economic activity at the study area?
2. What are the common methods for collection of NWFPs?
3. How the local people perceive the NWFPs?
4. What are the main NWFPs producing trees?
5. Is there any inventory made for the NWFPs producing trees?
6. Is there any inventory made to estimate the regeneration of NWFPs producing trees?
7. Is there any study made to investigate the seed bank at the study area?
8. Is there any extension services provided in the fields of NWFPs
9. How you assess the stocking density and prevalence of NWFPs producing trees?
10. Where from NWFPs are collected in the study area?
11. What are the techniques used in the collection of NWFPs?
12. What are the main objectives behind the collection of NWFPs?
13. How the NWFPs are marketed in the study area?

Appendix (2)

Questionnaire of local people

The post-graduate student Mymoona Ali El Nadif registered for the M. Sc in the field of community forestry. Her research focuses on Non – forest product. Your help, through provision of accurate information will enhance the attainment of the degree. Your answers will be highly confidential and will not be used for any other purpose other than this.

Households' questionnaire:

Date of interview -----

Unite (1)

Demographic Data

Locality Unit Village Tribe

1-1 Age of the respondent----- years

1-2 Sex Male () Female ()

1-3 Material status: Single () Married () Divorce () Widow ()

1-4 Educational level: Illiterate () Khalwa () Primary () Secondary ()

Graduate () Post graduate ()

1-5 Household members (1- 3) (4- 6) (> 6)

1-6 what is your main job (Occupation)

Government employee () Farmer () Merchant () other specify

1-7 what your main source of income

Agriculture () Animals () NWFP () other specify

1-8 If you have another occupation (eg merchant or leader)

Please give estimate of your annual income ----- SDG/ year

1-9 what your seasonal calendar.

Activity	1	2	3	4	5	6	7	8	9	10	11	12
1												
2												
3												
4												
5												
6												

2-1 What are other important NWFP do you collect from the forest other areas and what are their sources?

Produce	Place of collection	Tree shrub	Herb	Animal	Other specify	Uses
Sidir						
Goddeim						
Tabaldi						
Aradeib						
Higleeg						

2-2 Who collects these products and from where and at what time of the day?

Collector	Own land distance traveled	Gifar land distance traveled	Governmental land distance	Time of the day and time spent in collection
Father				
Mother				
Children				
Others				

2-3 which periods do you collect each produce?

Produce	1	2	3	4	5	6	7	8	9	10	11	12
Sidir												
Goddeim												
Tabaldi												
Aradeib												
Higleeg												
Dom												

2-4 how often and how much do you collect and how much do you use at home, and how much do you sell and price?

Produce	Frequency	Quantity collected each time	Unit of measure	Part use at home	Part sell price	Place of sale
Sidir						
Goddeim						
Tabaldi						
Aradeib						
Higleeg						
Dom						

2-5 do you collect all the NWFPs available on the tree, why?

Yes ()

No ()

2-6 if no reason. a)..... b)..... c).....

2-7 which parts are used?

Produce	Leave	Fruit	Seeds	Flowers	Roots	Resins	Bark	Other specify

2-8 How do you collect the produce and what tool do you use (if any)?

Produce	1	2	3	4	5	6

- 1: climb the tree 2: shedding fruits using sticks. 3: cutting the leaves.
 4: using mats. 5: hand picking from the ground. 6: other specify.
 2-9 How do you store tree produce?
 2-10 Is there any processing or treatment for the produce before use, storage or sale? yes () no ()
 2-11 if yes what is it and why is done?

Produce	Sorting/reason	Grading/reason	Chipping/reason	Other specify reason
Sidir				
Goddeim				
Tabaldi				
Aradeib				
Higleeg				
Dom				

2-12 From where do you have the knowledge of extraction, handling, storage and uses?

2-13 Where do you sell the produce?

a) village () b) nearby village () c) other specify ()

2-14 who takes the produce to market and why this person particular?

a) father (reason) b) mother (reason) c) other specify reason.

2-15 Who gets the revenue from sale?.....

2-16 How do you transport to the market? and what is the transportation cost?

Produce	Donkey/cost	Karo/cost	Lorry/cost	Other (specify)

2-17 Who buy your produce (Describe the marketing chain)?

2-18 Is there any reference concerning the market, e.g. demand for certain types, varieties or qualities?

2-19 Do you pay any fees for collection? yes () no ()

2-20 If yes what type of payment and how much and how payment calculated?

Type of payment	Produce	Payment to forest adm.	To salvation committee	To rural counsel	To other specify	Total payment
Fees						
Tax						
Royalty						
Other specify						

2-21 Do you pay any fees for selling the produce yes () no ()

2-22 If yes what type of payment and how much, and how the payment calculated?

Type of payment	Produce	Payment to forest adm.	To salvation committee	To rural counsel	To other specify	Total payment
Fees						
Tax						
Royalty						
Other specify						

2-23 What are the problems and constrains facing the collection of NWFPs?

- 1.
- 2.
- 3.
- 4.

2-24 What are the problems and constrains facing the marketing of NWFPs?

- 1.
- 2.
- 3.
- 4.

2-25 Do you practice any management to develop or enhance NWFPs?

yes () no ()

2-26 If yes, how? a) b) c)

2-27 In what other way do you get use of the trees and forest?

a) Recreation. b) Children play. c) Shade for animal. d) Ecotourism. e) Other (specify).

2-28 How do you perceive these forest and trees and their products.

2- 29 What are the present prices of the product?

Product	Price

2- 30 Are these prices stable or variable over time, specify why?

.....

